EXPORT NUMBER

ADVERTISING INDEX—PAGE 145 BUYERS' DIRECTORY—PAGE 111 EDITORIAL INDEX—PAGE 86

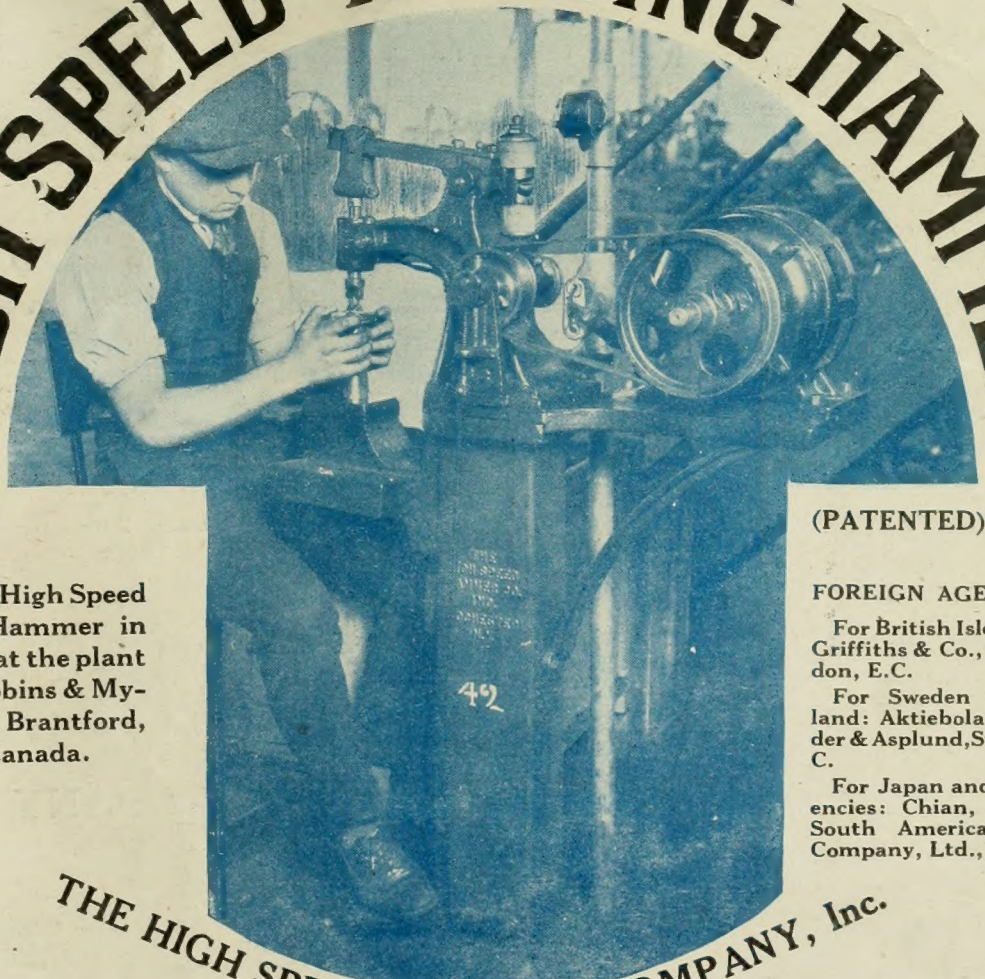
CANADIAN MACHINERY AND MANUFACTURING NEWS

Vol. XXV., No. 9 Published by the MacLean Publishing Company, Limited, Toronto March 3, 1921 $4.00 a Year Subscription Price

READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page	READ AND PASS TO	check	See Page
						RETURN TO.....	For	File

SPEEDING UP PRODUCTION WITH

HIGH SPEED RIVETING HAMMERS



(PATENTED)

Showing a High Speed Riveting Hammer in operation at the plant of The Robbins & Myers Co. at Brantford, Ontario, Canada.

FOREIGN AGENCIES:

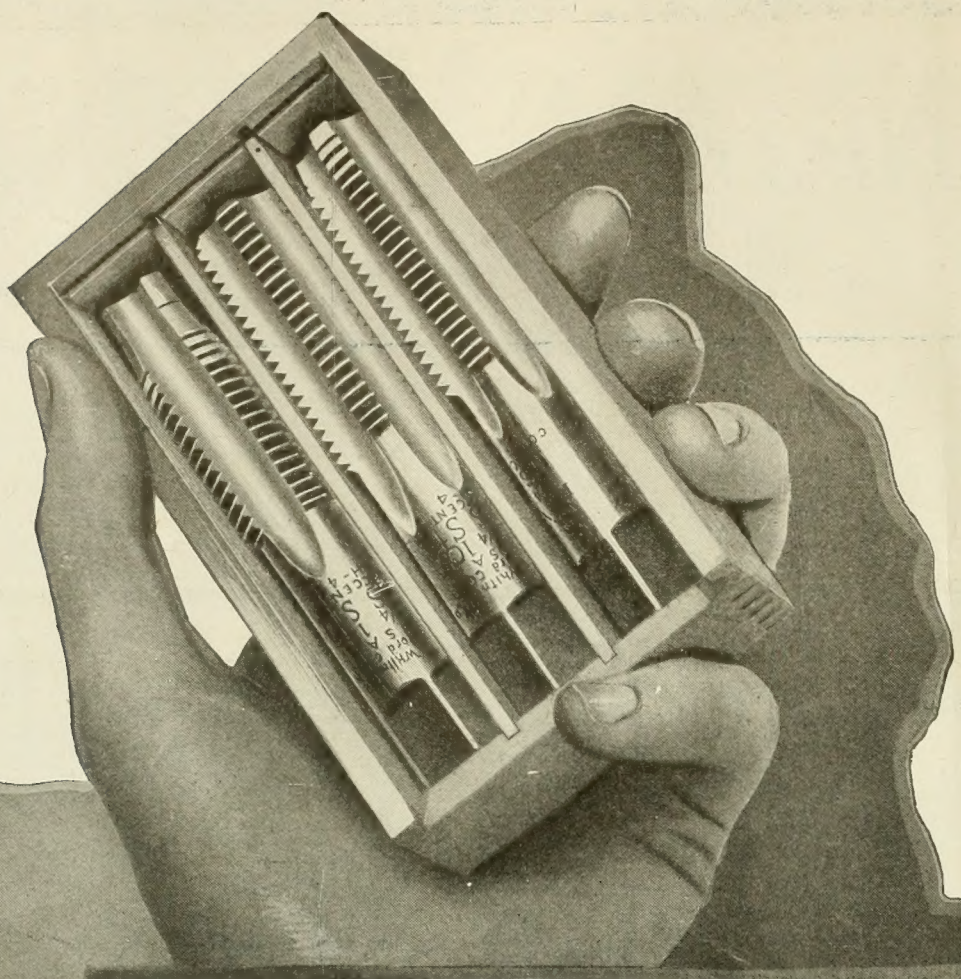
For British Isles: Burton Griffiths & Co., Ltd., London, E.C.

For Sweden and Finland: Aktiebolaget Rylander & Asplund, Stockholm, C.

For Japan and Dependencies: Chian, Japan & South America Trading Company, Ltd., Kobe.

THE HIGH SPEED HAMMER COMPANY, Inc.

ROCHESTER, N.Y., U.S.A.



P & W

Pratt & Whitney Taps

"With the 'Con-eccentric' Land"

P & W Taps are **good** taps—easily the best where accuracy and high speed are essential. They cost more to buy, but less to use than others.

If you're doing work that calls for big production and for unusual precision, give them a trial. You'll be back for more when you see them prove themselves.

The "con-eccentric" land—the special feature of Pratt & Whitney Taps, permits sharpening on face of the cutting edge without affecting size. It lengthens life and assures accuracy hitherto thought impossible in a commercial tool.

PRATT & WHITNEY COMPANY OF CANADA, LIMITED

Works: DUNDAS, Ontario

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

WINNIPEG
1205 McArthur Bldg.

HALIFAX
Roy Building

VANCOUVER
B.C. Equipment Co.

WINDSOR: Davis Building.

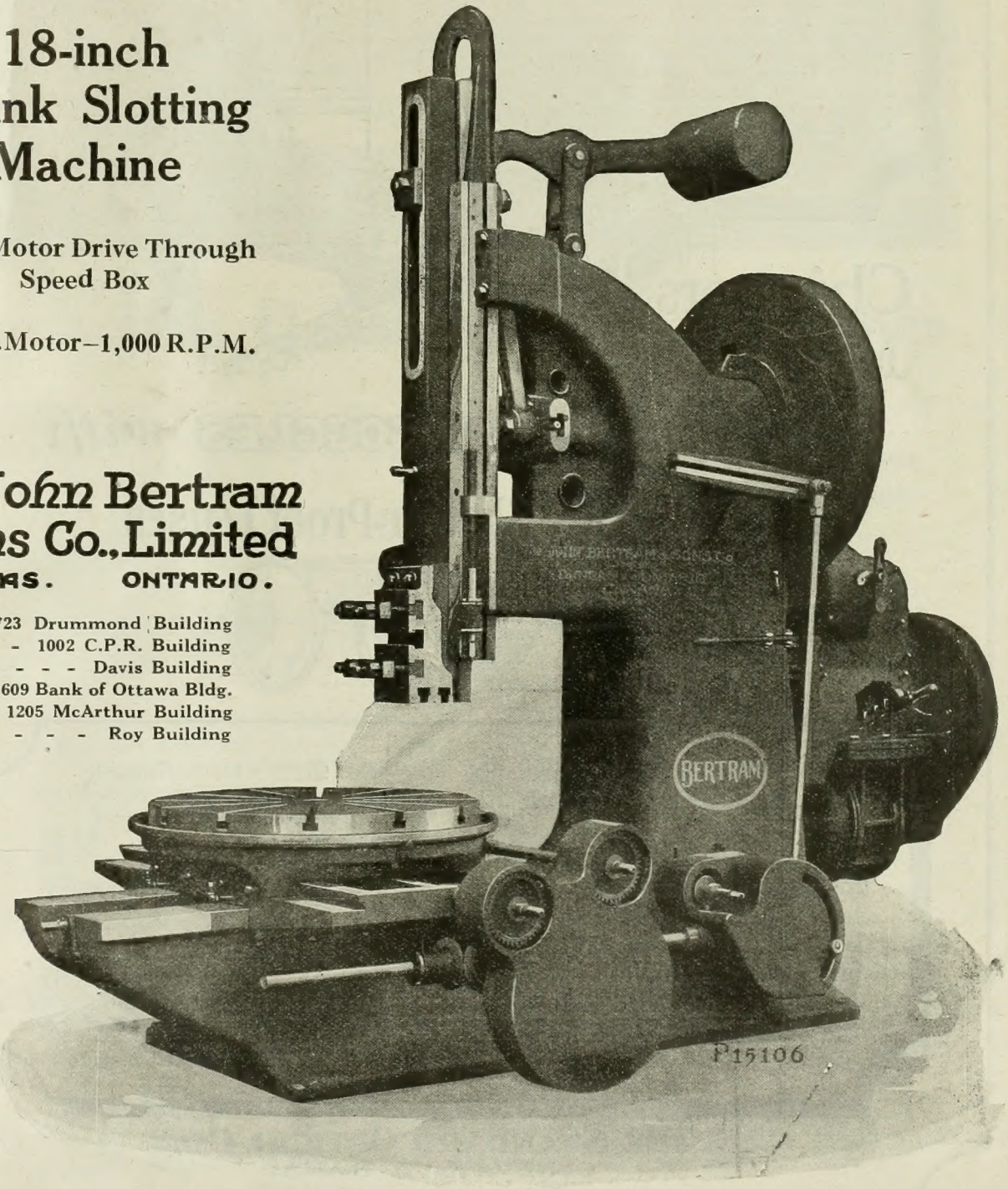
The BERTRAM Page

MACHINE TOOLS

18-inch Crank Slotting Machine

A. C. Motor Drive Through Speed Box

10 H.P. Motor—1,000 R.P.M.



The John Bertram & Sons Co., Limited

DUNDAS. ONTARIO.

Montreal, 723 Drummond Building
Toronto, - - 1002 C.P.R. Building
Windsor, - - - - Davis Building
Vancouver, 609 Bank of Ottawa Bldg.
Winnipeg, 1205 McArthur Building
Halifax, - - - - Roy Building

If interested tear out this page and place with letters to be answered.

Ever bark your shins on a rocker in a dark room? How'd you like to go through life doing it? *Wear your goggles!*

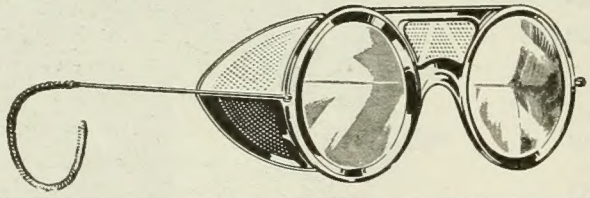
This is No. 2 of a series of short pointed paragraphs which will appear regularly in our advertising in the future. Permission is freely given Safety Engineers, Editors of Employees' Magazines and others to use this material as they wish. In addition we shall be glad to furnish these paragraphs in leaflet form, in any quantity, for insertion in pay envelopes or as posters on either paper for bulletin use or heavy card with string for hanging wherever needed.

Chippers Need

STOCO SAFETY GOGGLES with

(Pat. Dec. 12, 1916)

"CELOGLAS" Shatter-Proof Lenses

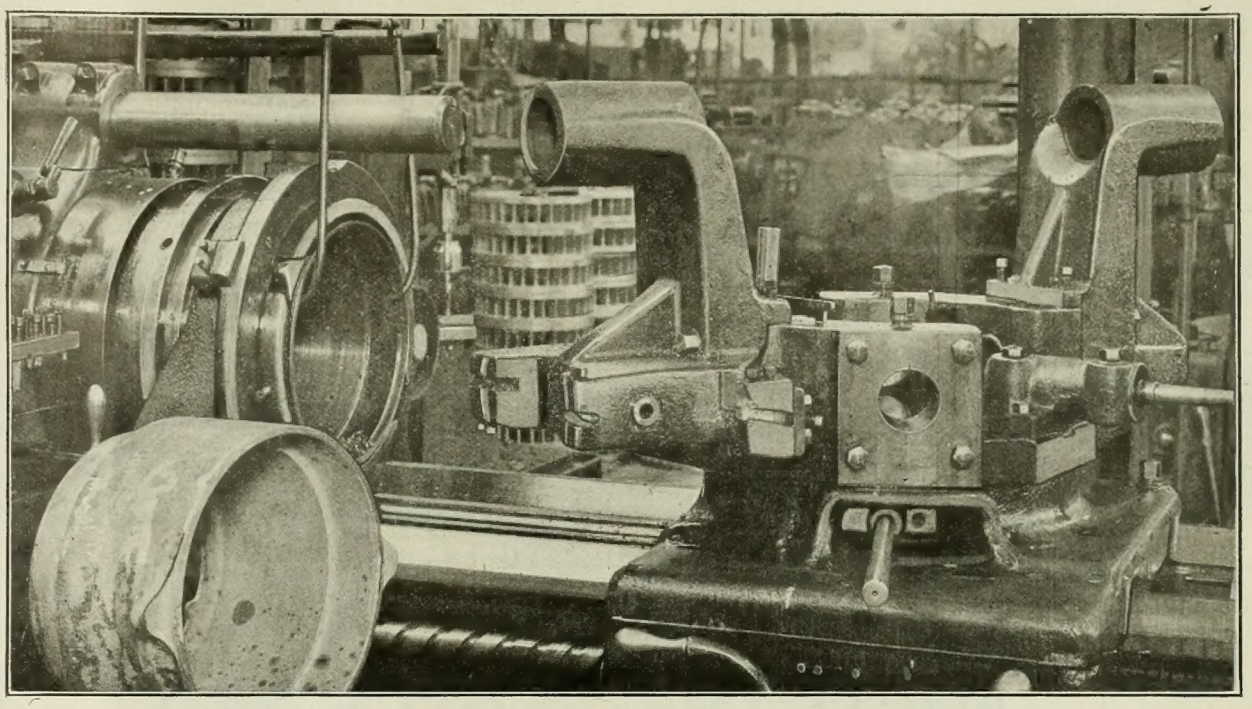


In spite of its husky strength the STOCO Safety Goggle is light, comfortable, and easy to wear—a glass that will take a lot of punishment and yet may be worn long hours at a stretch without discomfort to the eyes or face. Doubtless there are jobs in your plant that require the STOCO Safety Goggle.

The STOCO Safety Goggle.
Price each (f.o.b. Geneva, N.Y.)
With "Celoglas" Shatter-proof Lenses $1.15
With Optical Glass Lenses ... .90
Attractive Discounts for Quantity Orders.
Comfortable earbows, or black elastic headbands at the same price.

NOTE—A sample STOCO Safety Goggle will be sent interested responsible people on receipt of request on letterhead.

THE STANDARD OPTICAL CO.
GENEVA, N.Y. U.S.A.



Machining Delco Generator Frames

The photograph above shows a tool set-up on a Steinle 24-in. Turret Lathe for turning out Delco Generator Frames at the plant of the Delco Light Company of Dayton, Ohio.

The chucking fixture revolves in a steady rest and is equipped with centering and stop pins for centering and locating rear end of frame by pulling sleeve collar forward. Set screws hold the front end in place. The turret fixture is reinforced in the machining operation by the overhead bar support; thus preventing undue chatter or jar under the heavy cuts taken.

This is only one of a number of installations in plants manufacturing electrical equipment where the Steinle is called upon to produce various parts from castings, forgings or bar stock.

In view of present manufacturing conditions it is invariably performance that counts and the Steinle qualities of accuracy, speed, ease of operation, power, reliability and economy of upkeep are guarantees of satisfactory performance on your own work.

Material—Cast Steel

Finish—Bore, Counterbore, Face Bottom, Face Lugs

Time—25 Minutes Each

Why not send us your blueprints if your requirements call for the installation of equipment o this character? We shall be glad to furnish you with production and tooling estimates, or to have a qualified representative call and take up the question of Steinle methods as applied to your production problems.

STEINLE TURRET MACHINE CO.

Originators of the full swing side carriage turret lathe

MADISON, WIS., U.S.A.

AGENTS—Machine Tool Engineering Company, Singer Building, New York City; Cadillac Tool Company, Dodge Power Building, Detroit, Michigan; L. G. Henes, 75 Fremont Street, San Francisco, California, and Title Insurance Building, Los Angeles, California. FOREIGN—Leo. C. Steinle, 53 Victoria Street, London, England.

MARK OF ALGOMA O.H. QUALITY

View of the Algoma Steel Corporation's Plant from the water front

American Standard Sections of BEAMS and CHANNELS up to and including 15", all standard sections of ANGLES from 6" x 6" down to 1¼" x 1¼", ZEEBARS for car builders and general purposes, small and large ROUNDS and SQUARES and FLAT BARS up to 14" wide.

The quality of our product is of the very best—and is exclusively steel made by the Open Hearth Process, and can be furnished in all grades, from the softest rivet stock to high carbon special spring material. Order from us and you'll get both quality and prompt service. A trial is convincing.

Open Hearth
ALLOY STEELS

Chrome-Vanadium, Chrome-Nickel, Nickel.

All of these steels we supply in **Hot Rolled Bars.** We also furnish in **Bloom, Billet** and **Slab** form.

STEEL RAILS

Open Hearth Quality (all sections from 12 lbs. to 100 lbs. per yard).

SPLICE BARS
STEEL TIE PLATES
PIG IRON
(Basic, Foundry, Malleable)
SULPHATE OF AMMONIA

BLOOMS
BILLETS SLABS
STRUCTURAL STEEL
MERCHANT BARS
CONCRETE REINFORCING BARS
IRON, BRASS AND BRONZE CASTINGS

SULPHURIC ACID
NITRE CAKE

Prompt Shipments from Stock

ALGOMA STEEL CORPORATION, LTD.

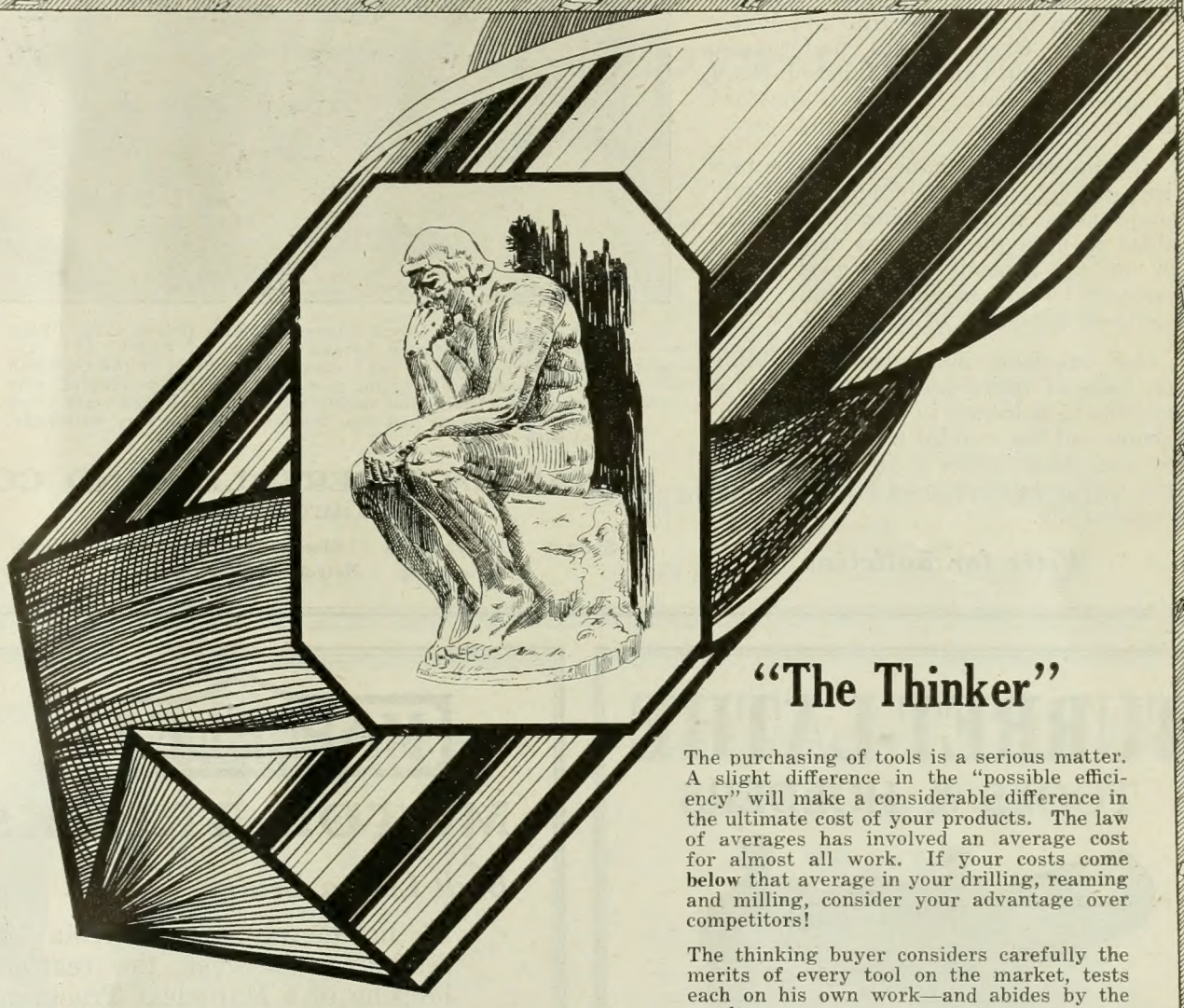
SAULT STE. MARIE, ONTARIO

SALES OFFICES:

Montreal: 606 McGill Building

Toronto: Bank of Hamilton Building

IMCO TOOLS



"The Thinker"

The purchasing of tools is a serious matter. A slight difference in the "possible efficiency" will make a considerable difference in the ultimate cost of your products. The law of averages has involved an average cost for almost all work. If your costs come **below** that average in your drilling, reaming and milling, consider your advantage over competitors!

The thinking buyer considers carefully the merits of every tool on the market, tests each on his own work—and abides by the results.

Catalog of "Imco" 3 and 4 lip drills, reamers and milling cutters upon request.

Eastern Representatives: WATT MACHINERY & EQUIPMENT CO., 344 St. James St., Montreal, Que.

Ingersoll Machine & Tool Co., Ltd.

Ingersoll, Ontario.

Toronto Office — 80 Bay St. Phone Adelaide 7227.

Chas. A. Strelinger Co. Ltd. Windsor, Ont.

If interested tear out this page and place with letters to be answered.

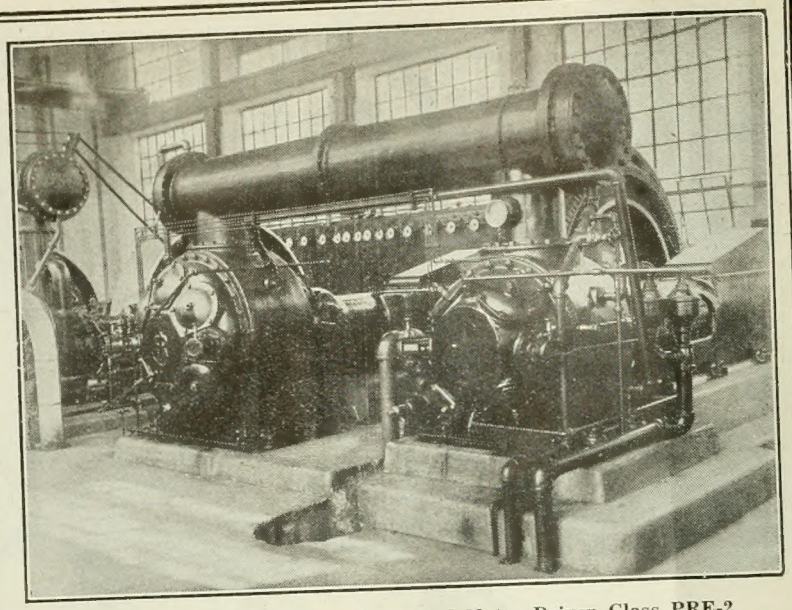
An Acid Test of Quality is the Repeat Order

IT is a significant fact that in most Canadian mines, shipyards and industrial plants, where careful performance records are kept, Canadian Ingersoll-Rand Compressors have become "standard equipment."

Starting ten, fifteen, or perhaps twenty-five years ago, with one of our old "Rand" compressors, new machines have been added to meet the increased demand for air and, as a result of the good service rendered by the original machine, later additions have been of our make.

Our experience in compressor building has been so varied and extensive that it qualifies us as leaders in this line of manufacture and has enabled us to place before the compressor buyer a line of machines that will meet every need efficiently and economically.

Write for bulletins

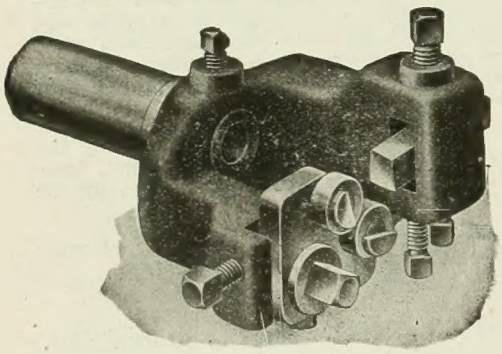


The 2,230 cubic foot Direct Connected Motor Driven Class PRE-2 Compressor illustrated herewith is one of five C. I. R. Co. Machines installed in the Longue Pointe Plant of the Canadian Steel Foundries during the past ten years. In speaking of their performance their chief engineer said: "I have been eight years with this Company and your machines and am very well satisfied with them."

CANADIAN INGERSOLL-RAND CO.
LIMITED

Sydney Sherbrooke Montreal Toronto Cobalt
Winnipeg Nelson Vancouver

TURRET-LATHE
TOOLS & HOLDERS



COMPLETE EQUIPMENT FOR CAPSTAN LATHES FULLY ILLUSTRATED IN OUR TOOL LIST E.

Sales Agents Wanted

J. ACKWORTHIE LTD.
COLESHILL STREET,
BIRMINGHAM
ENGLAND

MAPLELEAF
MOTOR TRUCKS

Built Like a Bridge

It's not merely an accidental resemblance between the rear-end housing of a Mapleleaf Truck and the tremendous ruggedness of a steel bridge. The Mapleleaf rear axle is designed to carry heavy loads with as much indifference as a big bridge does.

The axle shafts are of the same big, husky design. They are made of the strongest steel alloy known, and revolve in the wheel on roller bearings.

You ought to see this axle. You will have a great respect for the truck of which it is a part.

Mapleleaf Manufacturing Company
LIMITED
MONTREAL - CANADA

New Truths and Old Fallacies

Hardness of Alloys—*Continued*

Referring again to the test made by Professor Robert H. Smith, concerning the hardness of Magnolia, he said: "The longer the Magnolia bearing is used, and the more severe the duty imposed on it, the better becomes its condition."

When these tests were made by Professors Smith and Goodman, it is questionable whether either of them had considered the fusibility of alloys as affecting the values, but Professor Smith specifically says that he found Magnolia much superior to either Babbitt (Genuine) or Gun Metal (bronze).

The mention of bronze reminds the writer of an incident related to him by Mr. F. L. Johnson, once Associate Editor on "Power" and previously for many years a practical operating manager of large plants. When he was in charge of the Baltimore Copper Works a delay occurred in delivery of bronze bearings for the rolls. Without consulting him a supply of Magnolia was sent to tide over this critical period.

As there was no help for it, he poured the Magnolia bearings and then waited around for the expected trouble. To his great surprise the Magnolia lined bearings ran cool and far surpassed the bronze bearing in wear, and from that day he never used any metal on any bearings other than Magnolia, when he could get it.

Such demonstrations of Magnolia's capacity to sustain heavy loads and without injury, do not happen from chance. Magnolia is not only sufficiently hard, but is protected by its other qualities from heating and rapid wear on bearings, which are destructive to most babbitts.

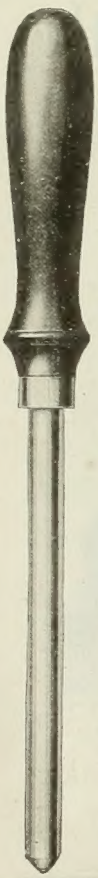
Magnolia also favors adjustment to any inequalities of bearing or shaft, thereby distributing the load uniformly over the entire surface.

(Continued next month)

For Copy of complete article :
"New Truths and Old Fallacies"
Address our Montreal Office

Sold by Leading Dealers Everywhere or by

Magnolia Metal Co. of Canada
Limited
Office and Factory :
37-39 Shannon Street, Montreal, Que.



DIAMOND HAND TOOL

For the dressing of precision grinders there has not yet been discovered any satisfactory substitute for diamonds.

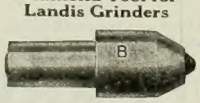
Our diamonds are selected and mounted with great care, and the quality of work and stones is fully guaranteed.

The Canadian Desmond-Stephan Mfg. Company, Limited
Hamilton - - Ontario

Diamond Tool for Norton Grinders

Actual Size

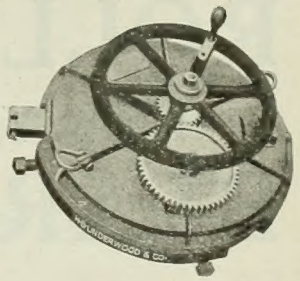
Diamond Tool for Landis Grinders



Actual Size

Locomotive Cylinder or Dome Facing Machine

Users of this improved tool are eloquent in their praises of its performance.



All working parts are covered and easily oiled. Gearing is all cut from the solid. When working the clutch is thrown in by moving the lever with clutch pin attached (shown in cut, on top near the hand crank) and the machine will feed automatically. Made in sizes to suit requirements.

Taper socket can be furnished to take the place of hand wheel for air motor drive.

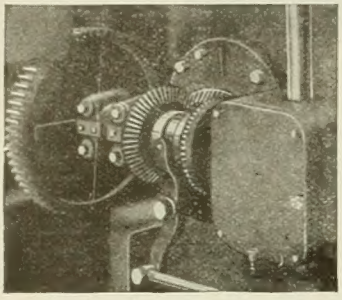
When ordering give the inside diameter of the work for which they are wanted. Details on request.

H. B. UNDERWOOD CORPORATION
1015-1025 Hamilton St., Philadelphia, Pa., U. S. A.

If interested tear out this page and place with letters to be answered.

THE JOHNSON FRICTION CLUTCH

Clutches for Reversing Functions



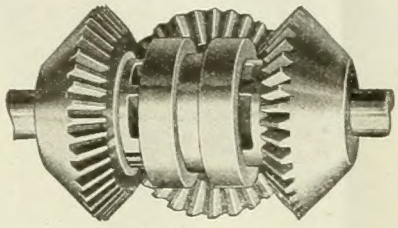
Johnston Clutch Installation on a Newton Milling Machine

A reversing clutch is a very common requirement on machinery, and one which is encountered in many different forms. Whatever the situation may be, a Johnson Clutch offers the best method of handling it.

The bevel gear assembly shown here is one of the ways in which a Johnson Double Clutch is frequently applied for reversing functions. Many of the best machine tools are equipped in this manner.

Write for our Yellow Catalog and Booklet,

"Clutches As Applied To Machine Building."



Double Clutch in Nest of Bevel Gears

CANADIAN AGENTS:

WILLIAMS & WILSON, LTD., 84 Inspector St., Montreal

CANADIAN FAIRBANKS-MORSE CO., LIMITED, Montreal, Toronto, Winnipeg

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER, CONN.

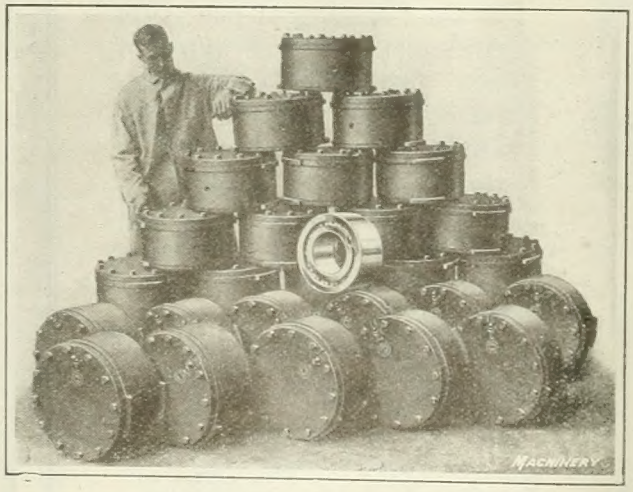
A Mighty Test of Bearing Strength

At Lakehurst, N.J., the huge structural steel doors of the United States Government dirigible hangar are mounted on trucks provided with unusually large Rollway Roller Bearing Journal Boxes. Each journal box weighs 392 pounds when assembled. The tremendous weight resting on these

ROLLWAY
HEAVY DUTY
BEARINGS

can be more readily appreciated when it is stated that these doors are 135 feet high, 165 feet wide, 13 feet thick at the base and weigh 3,500 tons. Each door is mounted on four electrically-operated trucks which run on two standard gage railroad tracks 165 feet apart.

Rollway Bearings represent economy and durability. For use wherever a Bearing is necessary.



Set of thirty-two Journal Boxes which is required for each of the four Hangar Doors. Each door weighs 7,000,000 lbs.

RAILWAY ROLLER BEARING CO.

SYRACUSE, N.Y.

CANADIAN STEEL FOUNDRIES LIMITED

AMONG OUR PRODUCTS

O. H. STEEL
- Bolsters
- Couplers
- Draft Arms
- Locomotive Side Frames
- Machinery Castings
- Marine Castings
- Rolling Mill Rolls
- Wheel Centres

FERRO-ALLOYS

MANGANESE-STEEL
- Bucket Lips
- Crusher Jaws
- Dipper Teeth
- Mixer Teeth
- Special Trackwork

OTHER ALLOYS
- Crank Pins
- Crank Shafts
- Locomotive Frames
- Rolls
- Roll Shells

TRACKWORK
- Diamond Crossings
- Crosses
- Frogs
- Mates
- Switches
- Rail Braces
- Guard Rail Clamps
- Complete Intersections

This list is merely an indication

General Offices:
Transportation Building, Montreal

WE CAN SUPPLY

STEEL PLATE

—IN—

Universal Edge - up to 40 in. wide

Sheared Edge - up to 60 in. wide

Any Thickness **Any Lengths**

Send Us Your Enquiries.

Dominion Foundries & Steel, Limited
HAMILTON, ONTARIO

If interested tear out this page and place with letters to be answered.

Ford-Smith

Machine Tools of Quality, Canadian Made

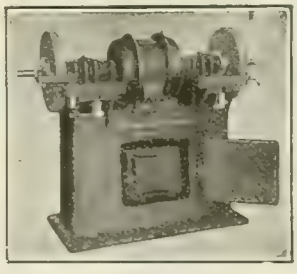
Heavy Type Polishing Machine.

MILLERS AND GRINDERS

Built to Meet Your Requirements

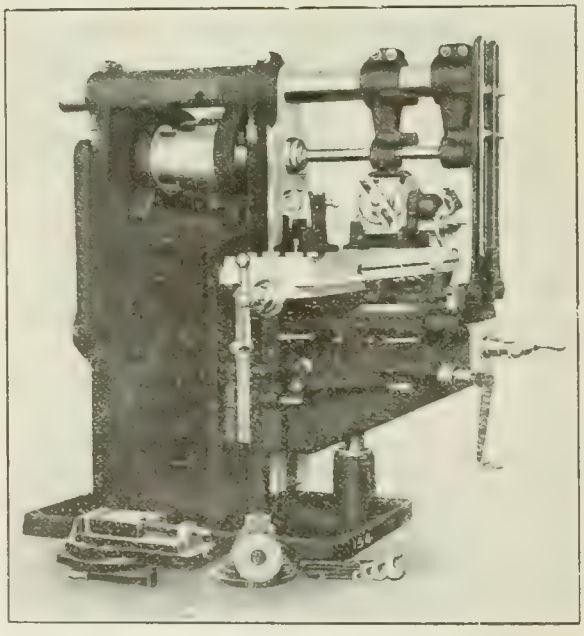
Heavy Type Floor Grinder.

"Built for Service" aptly describes Ford-Smith Millers and Grinders. No other phrase would do as well; and after all, Service is what you are most interested in. That's what you pay your good dollars for, and that's what you **get** in Ford-Smith Tools.



Motor Driven Floor Grinder.

Particular attention is directed to our Milling Machines —they are correct in design, built to last, and insure rapid quality production. Extensive use throughout the country is proof of their popularity.



Ford-Smith Grinders are built in designs to suit every grinding need—Motor Driven Grinders, Floor Grinders, Disc Grinders, Water Tool Grinders, Special Grinding Machinery, Buffers and Polishers.
Write for our complete catalogue.

THE FORD-SMITH MACHINE COMPANY

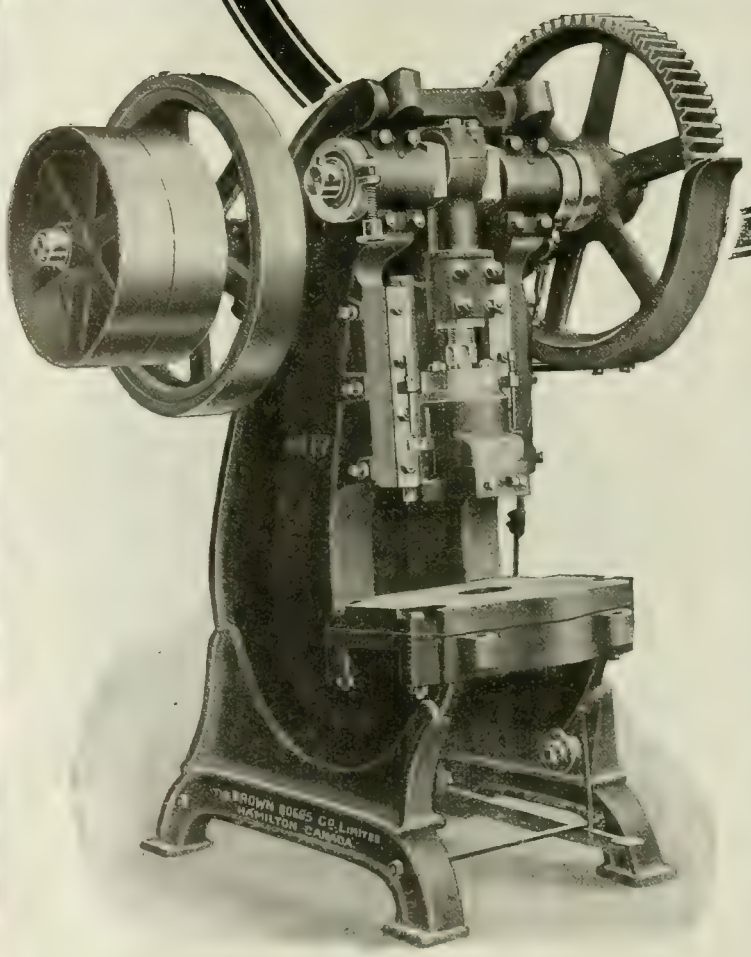
LIMITED

HAMILTON, ONTARIO, CANADA

FOREIGN AGENTS: W. E. Storey, 3 Arundel St., London, England; Gollin & Co., Melbourne, Australia; Atchier Demoor, Brussels, Belgium; British & Canadian Hydraulic Tube Co., Johannesburg, So. Africa.

EXPORT ORDERS RECEIVE OUR SPECIAL ATTENTION

"B-B" POWER PRESSES



No. 17—Geared Inclinable Press

"B-B" Power Presses are amply powered machines with a reputation for sturdy dependability.

Made in different types for blanking, forming, punching, trimming, etc. Let us send you full particulars.

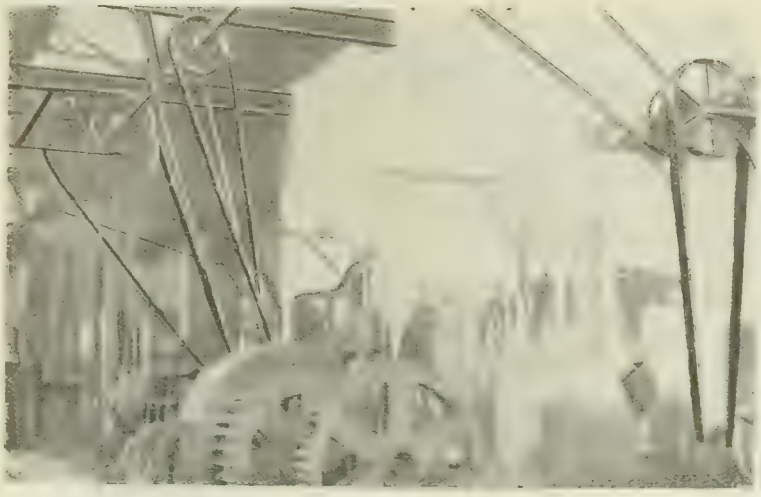
The

Brown-Boggs Company, Limited

Hamilton, Ontario

If interested tear out this page and place with letters to be answered.

Solid Woven Belting



Solid Woven Hair Belting
Driving Heavy Machine Tools

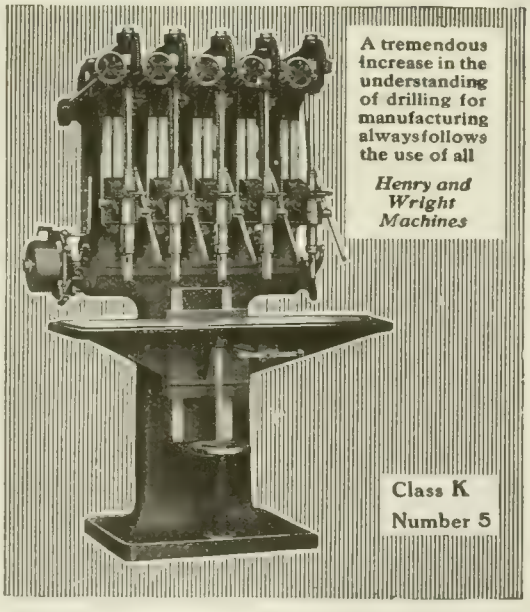
Solid Woven
Cotton
Hair
Twintex

These beltings will solve your driving problems and save you money.

SUMNER & CO.
108 WORTH ST.
NEW YORK

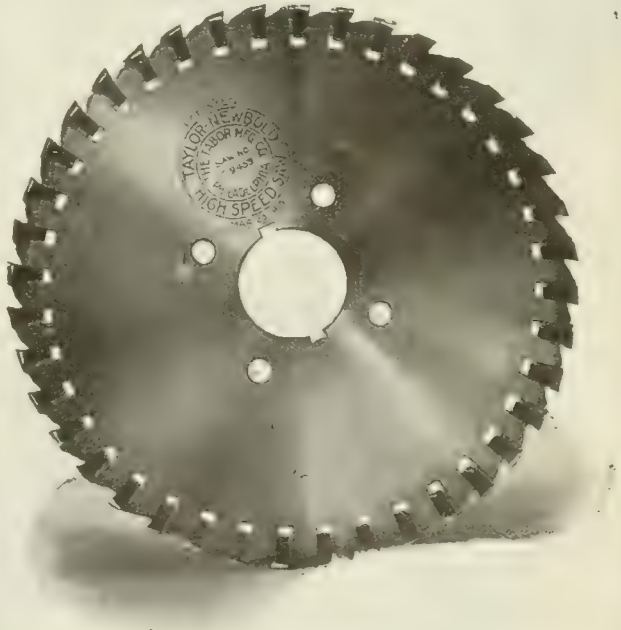
Representative for Eastern Canada
GEORGE F. SHEPPARD
702 Southam Bldg., Montreal

HENRY & WRIGHT
Drilling Machines


A tremendous increase in the understanding of drilling for manufacturing always follows the use of all
Henry and Wright Machines
Class K
Number 5

The Henry & Wright Mfg. Co.
Hartford, Conn.
New York Office: 136 Cedar Street
Canadian Fairbanks-Morse Co., Montreal, Toronto, Winnipeg; A. R. Williams Machinery Co., Toronto, St. John, N.B.; H. W. Petrie, Ltd., Toronto; Williams & Wilson, Montreal; Rudel-Belnap Machinery Co, Montreal; Canada Machinery Corp., Galt, Ont.; Geo. F. Foss Machinery & Supply Co., Montreal; General Supply Co., Montreal.

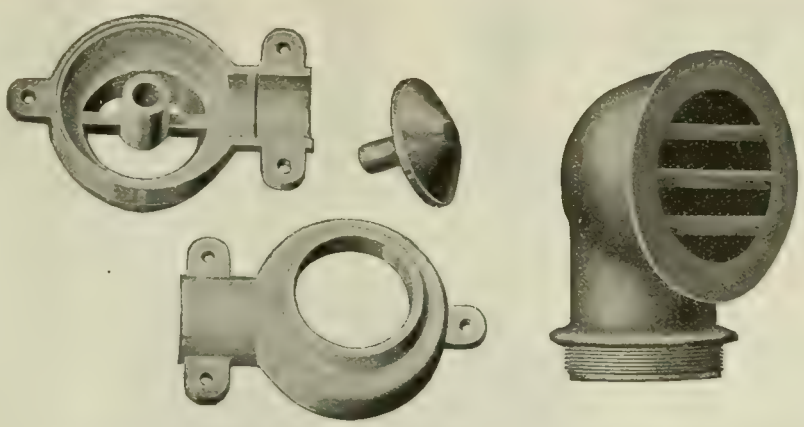
THE IMPROVED
TAYLOR-NEWBOLD



INSERTED TOOTH COLD SAW
WRITE FOR BULLETIN T-S
Tabor Mfg. Co., Philadelphia, Pa., U.S.A.

DIE-CASTINGS

DOEHLER PROCESS



MADE IN CANADA

Note the smooth appearance of the Die-Castings in the illustration. No burrs—no rough spots. Cored holes are perfectly round and centred. Require practically no machining

SEND BLUE PRINTS TO US FOR ESTIMATES

Manufactured by

Tallman Brass & Metal Limited
HAMILTON, ONT.

LA SALLE

Has an Advantage Over Other Grinders

There is some outstanding feature of all La Salle Grinding Machines that lends it exceptional productive ability.
The American Drill Grinder is especially adaptable for grinding twist, flat and three-lipped drills, because it has automatic lip rest and caliper jaw device, which assures proper clearance on all sizes of drills automatically. Send for descriptive matter covering our entire line of grinding machinery.

American Drill Grinder
For Wet or Dry Drill Grinding 1/8" to 2¼". Also 1/8" to 3½" dia.

LA SALLE TOOL CO.

La Salle, Illinois, U.S.A.

Represented in Canada by

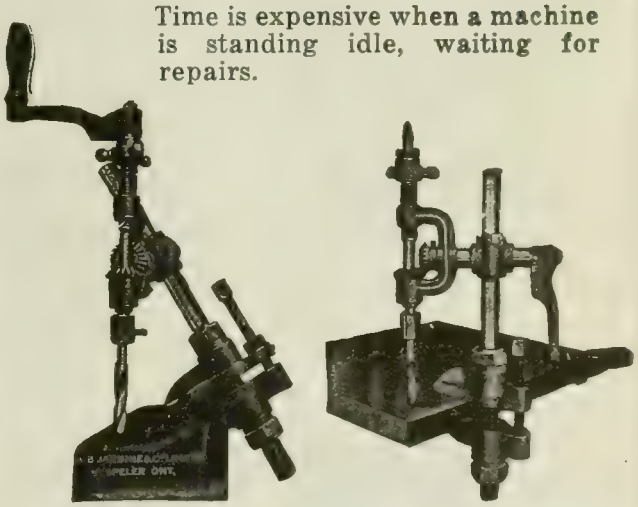
A. R. Williams Machinery Co., Ltd.

64-66 Front Street W., Toronto

Halifax St. John, N.B. Montreal Winnipeg Vancouver

Jardine Universal Ratchet Drill

Time is expensive when a machine is standing idle, waiting for repairs.



On the average repair job, this machine completes the drilling in less than the time required to set an ordinary ratchet to begin.

Weight, 40 lbs. Price, $26.50 net.

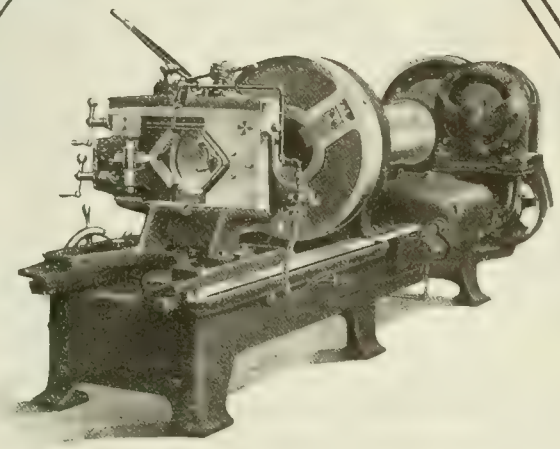
Sold by all Machinery and Supply Houses.

A. B. JARDINE & CO., Limited

HESPELER, ONTARIO

If interested tear out this page and place with letters to be answered.

WILLIAMS



PIPE MACHINES

Outstanding Features:

1—Single Pulley Drive, through.
2—Dodge Friction Clutch, on machine.
3—Clutch Lever at operator's left hand.
4—Rigid Bearing Bracket on drive shaft.
5—Gear Box Drive away from operator.
6—Individual Adjustment for each bearing.
7—Large Spindle Bearings are ring oiling.
8—Compact Control Levers on operator's side.
9—Large Die Cabinet and Tool Tray.
10—Substantial Oil Trough around top of ways.
11—Specially constructed Reservoir and Filterer.
12—Low-down Sliding Head.
13—Rotary Geared Pump reversible for left-hand thread.
14—Specially designed Carriage to drain off oil and cuttings.
15—All Gears amply protected.

Send for Catalog of Various Styles

WILLIAMS TOOL CORPORATION

of Canada, Limited - Brantford, Ontario

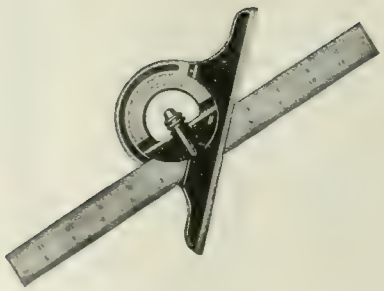
Successors to

JOHN H. HALL & SONS, LIMITED

Have You the Missing Tool?

For laying out work any Starrett dealer can supply you with as many as twelve Bevel Protractors, three Universal Bevel Protractors, or twelve Combination Sets, which include slide, square, center and protractor heads.

Six of the Bevel Protractors are made with the head extending over both sides of the blade. Of the three Universal Protractors, two are equipped with verniers.



Have you the tool this man should be using? Look it up in Catalog No. 22 "3".

THE L. S. STARRETT COMPANY

The World's Greatest Toolmakers
Manufacturers of Hack Saws Unexcelled
ATHOL, MASS.

42-156

Use Starrett Tools

If interested tear out this page and place with letters to be answered.

OAKITE

GRINDING COMPOUND

—Keeps wheel clean.
Helps prevent loading.
Keeps work clean and wheel at even temperature.
Increases production.
Is economical—Saves power.
Saves diamonds used for dressing or truing.
Lengthens wheel life

No Rust After Grinding

A factory that now uses Oakite Grinding Compound on ball bearing parts, reports entire elimination of rust experienced in past when soda solution was used.

Another plant uses Oakite Grinding Compound on steel razor blades, and has done away with the rust encountered when kerosene and soda ash compound was used.

This advertisement is one of a series based on actual occurrences in our files

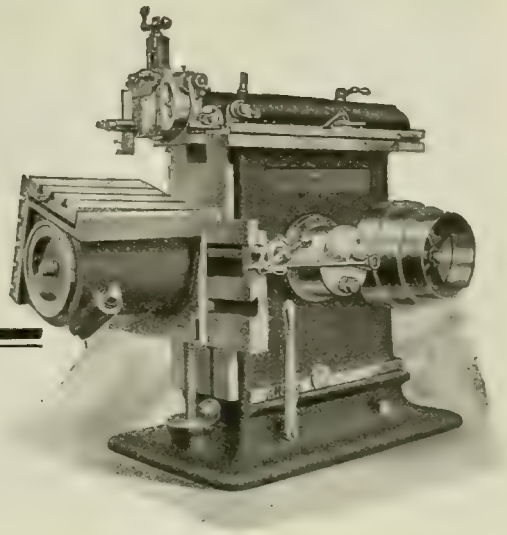
A gas engine factory reports they are grinding 18 shafts before dressing wheel, whereas before using Oakite Grinding Compound they could not grind more than 10 shafts without dressing.

Have you a grinding problem?

OAKLEY CHEMICAL CO.
44 THAMES STREET · NEW YORK

UNIVERSAL

SHAPING MACHINES



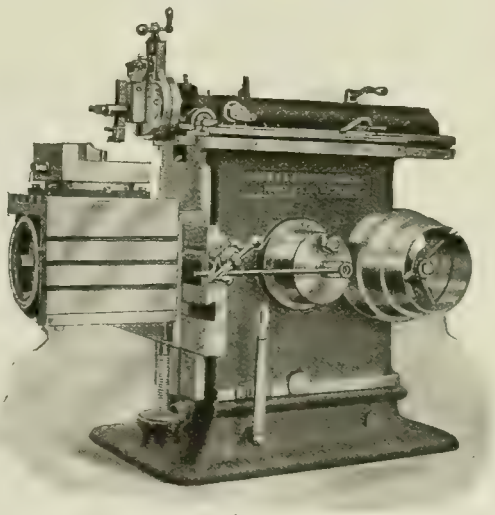
No special vises or fixtures needed; the Universal features of these machines take care of everything, making them particularly adapted to—

Die Work
Tool making and
General Manufacturing.

Machines regularly furnished with—

Swivelling Graduated Table
Auxiliary Tilting Side for Compound Angles.
Power Down Feed on any angle, with any variation of feed
Automatic Feed Stop
Graduated Collars on Tool Head Feed Screw and Table Feed Screw
Swivel Vise and Graduated Base
Table raised and lowered by power on 24-in. size.

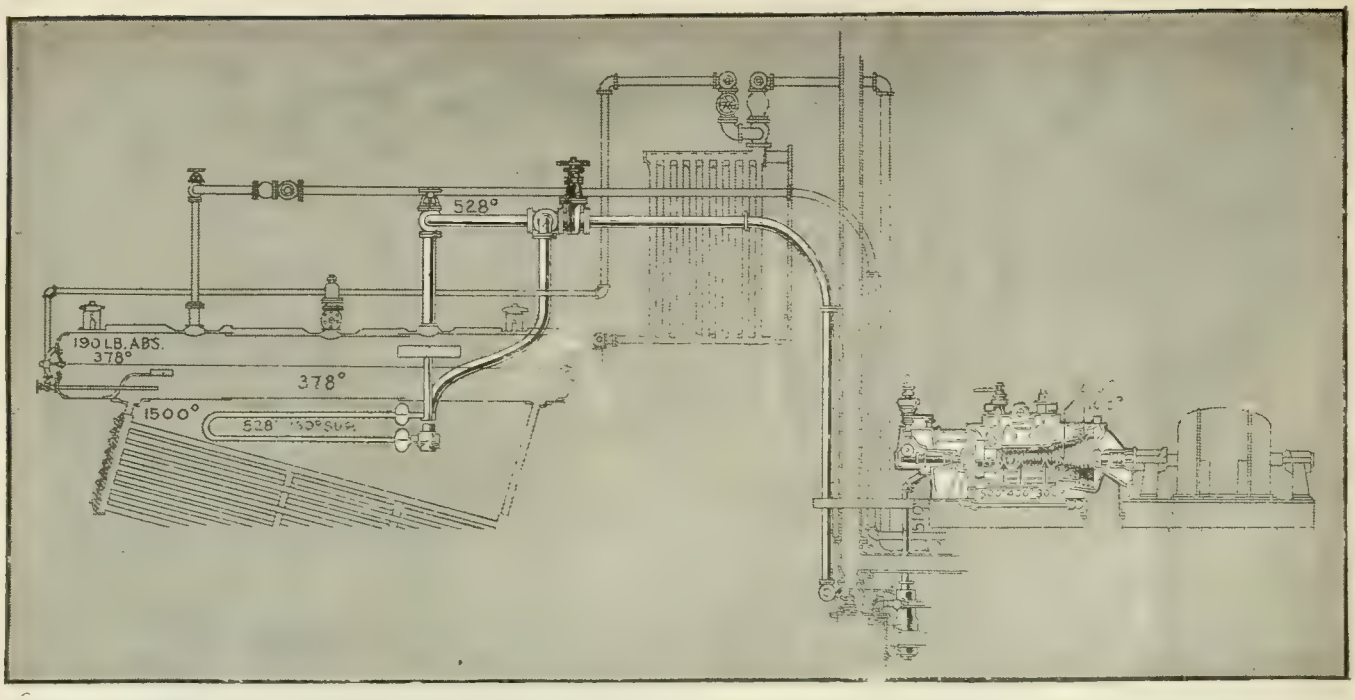
We carry large stocks of our 15-inch and 24-inch shapers in our Toronto show rooms—all ready for immediate shipment.



Canadian Offices: **POTTER & JOHNSTON MACHINE CO.**

ROELOFSON MACHINE & TOOL CO., LIMITED

Head Office and Show Rooms:
11 Wellington Street East - TORONTO, CANADA



Monel metal for superheat

HIGH machine speeds, constantly increasing demands on already installed steam lines, have forced power plants to superheat.

Commonly used "steam" metals cannot survive the chiseling attack of steam, superheated and under high pressures. So leading designers specify Monel metal.

Monel is used for guide stems, wedges, seat rings, spindles, pistons, etc., in great valves built by Chapman, Crane, Jenkins, Lunkenheimer, Nelson, Pratt & Cady and others equally prominent. It is used as blading, poppet valve parts, etc., in large steam turbines.

In power plant condensing and auxiliary apparatus Monel is used as meter parts, valve trim, pump rods and liners, etc. For only Monel combines the strength of steel with the ability to withstand the combined chemical and mechanical attack of high pressure and superheated steam, most acids and alkalies. Steam wear and water slippage is reduced to the minimum, machine life is lengthened, service is uninterrupted by costly shut-downs and expensive repairs.

Monel is being rapidly adopted for service calling for acid, alkali, high heat and steam wear resistance. It has a prominent place in the specifications of the largest engineering organizations in the country.

The International Nickel Company of Canada, Ltd.
Harbor Commission Building, Toronto, Ont.

The name Monel identifies the natural nickel alloy—67% nickel, 28% copper and 5% other metals—produced by The International Nickel Company. Monel products include Monel blocks, Monel rods, Monel castings, Monel sheet, Monel wire, Monel strip stock, etc.

INCo Monel metal

THE INTERNATIONAL NICKEL COMPANY

INCo MONEL METAL INCo NICKEL

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Vitrified
Grinding Wheels

These wheels are the most generally used and give the greatest satisfaction for the majority of grinding jobs, since the bond is less affected by heat and may be used wet or dry. The Vitrified process affords a wider range of grades, the wheel is more open in texture and more free-cutting. It takes from 20 to 30 days to carefully manufacture a wheel by this process.

Silicate
Grinding Wheels

Silicate Wheels may be manufactured in 24 hours. They are often substituted for Vitrified wheels when it is inconvenient to wait the longer time required to manufacture wheels by the Vitrified process. These wheels derive their name from the large portion of silicate contained in the bond. We manufacture Silicate wheels with or without web as specified by the customer.

CANADIAN HART WHEELS

Made-in-Canada

IN ALL grinding, the main problem is found in the dissipation of the heat generated. A wheel manufactured of proper abrasive grains, of a proper degree of hardness, will produce a minimum of heat, and this heat will be dissipated with the least injury to the wheel or material ground.

Once you find the correct grade and grain, you want to feel **sure** that **every** future wheel you order will give the same satisfactory service as the first.

The unvarying uniformity of Canadian Hart Wheels is a recognized fact which more and more shops are coming to depend upon. **Why not you?**

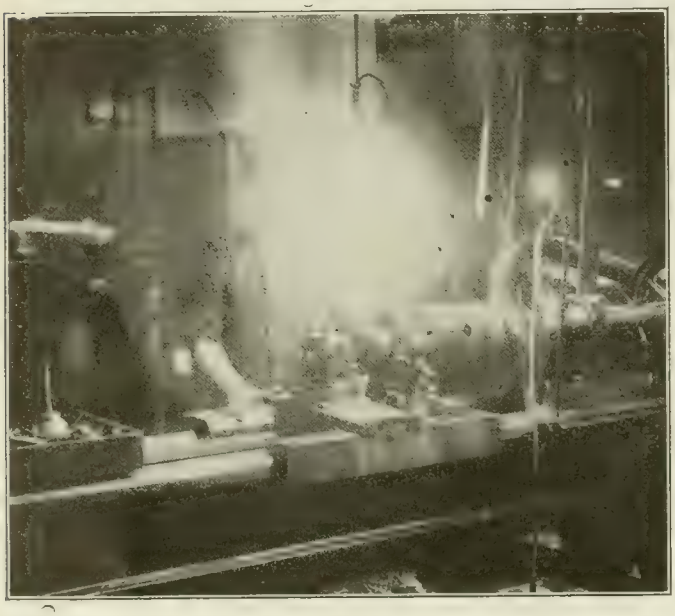
Tell us what you have to grind and we'll tell you the wheel to use.

CANADIAN HART PRODUCTS
LIMITED

HAMILTON, CANADA

If interested tear out this page and place with letters to be answered.

Correct Lighting in your Plant means More Work and Better Work



Let Us Ease the Eye Strain

Good lighting is a factor of first consideration in any effort to improve workmanship, increase production, reduce spoilage and safeguard employees.

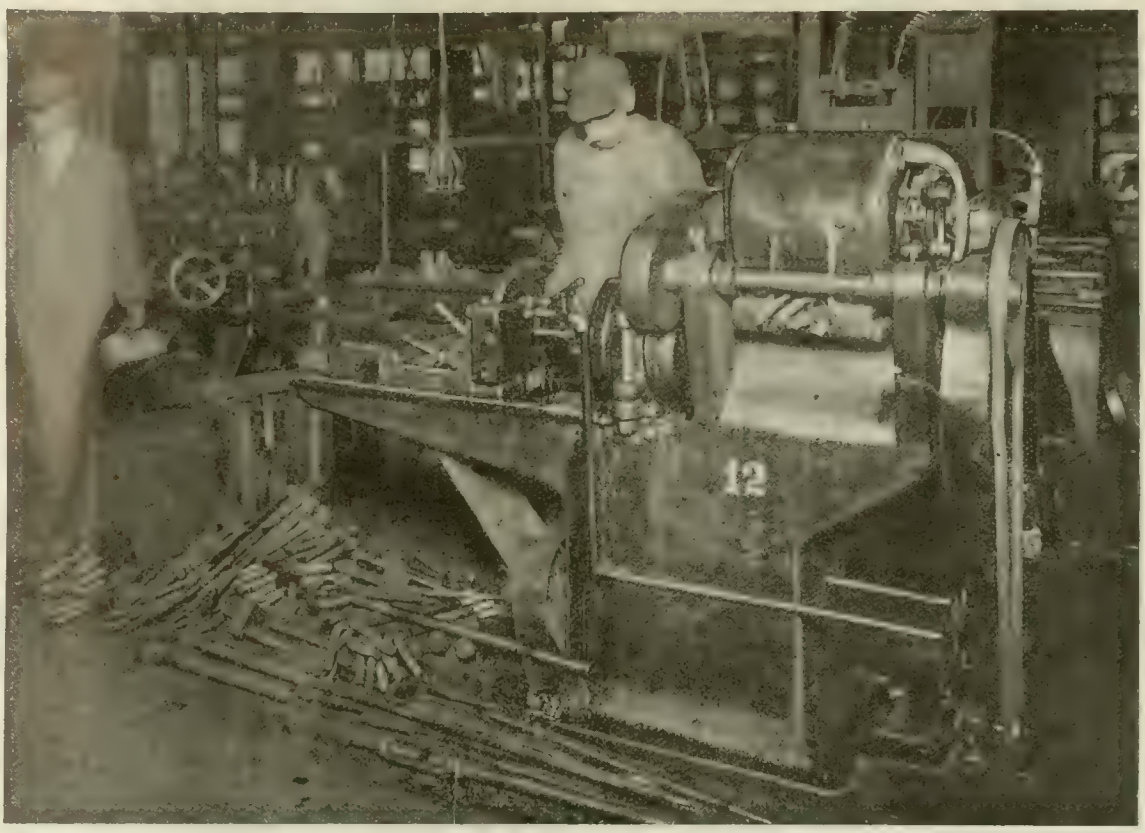
A poorly lighted plant breeds weariness and discontent, resulting in uneven production and waste. Ease the eye-strain and get more and better work from a happier staff by installing a correct Industrial Lighting System in your plant.

Our Illumination Engineers will gladly help in solving your particular lighting problem by planning the system that will most efficiently and economically meet your need. Such well-known names as Benjamin, Adams & Bagnall and Overbaugh and Ayres are included in our stocks of Illumination Equipment.

Northern Electric Company
LIMITED

Montreal Quebec Hamilton Toronto Winnipeg Regina Vancouver
Halifax Ottawa London Windsor Calgary Edmonton

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



"We just keep feeding 'em to 'er and she eats 'em just like any other Landis."

That was the foreman's reply at the Reading Iron Co.., Reading, Pa., when we asked him about the upkeep of this Landis Bolt Threading Machine during his three years in the plant.

This machine has been threading bolts 2″ in diameter for the past 10 years and is as good to-day as when first installed.

Landis Threading Machines

are rapid, rigid, durable and dependable. They are built to withstand the roughest usage and insure long life. It will pay you to investigate the merits of Landis Pipe and Bolt Threading Machines and Landis Die Heads. Write for full particulars to-day.

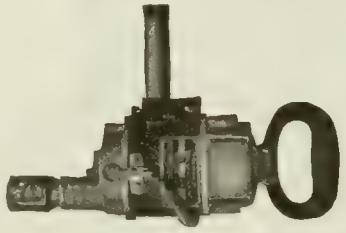
LANDIS MACHINE COMPANY

WAYNESBORO, PA.

If interested tear out this page and place with letters to be answered.

U. S. Electric Drills and Grinders

Save Time, Labor and Money



They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

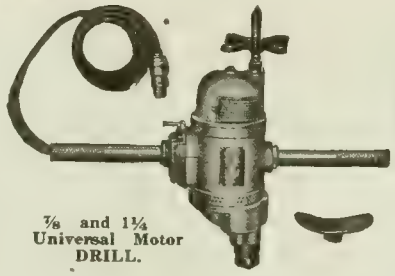
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs.
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜ and 1¼ Universal Motor DRILL.

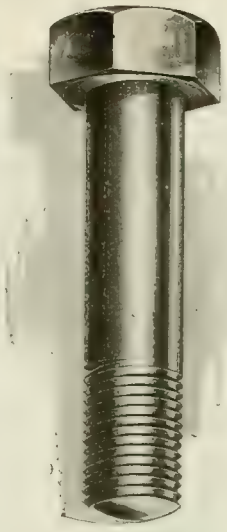
For Sale By

The Canadian Fairbanks-Morse Co., Limited

Montreal, St. John, N.B., Toronto, Winnipeg, Calgary, Vancouver

THE UNITED STATES ELECTRICAL TOOL CO.

CINCINNATI, OHIO



ACCURACY

Just now all jobbers should have a complete stock of SAE Cap Screws, Plain and Castellated Nuts and Taper Pins to meet the automobile repair trade requirements.

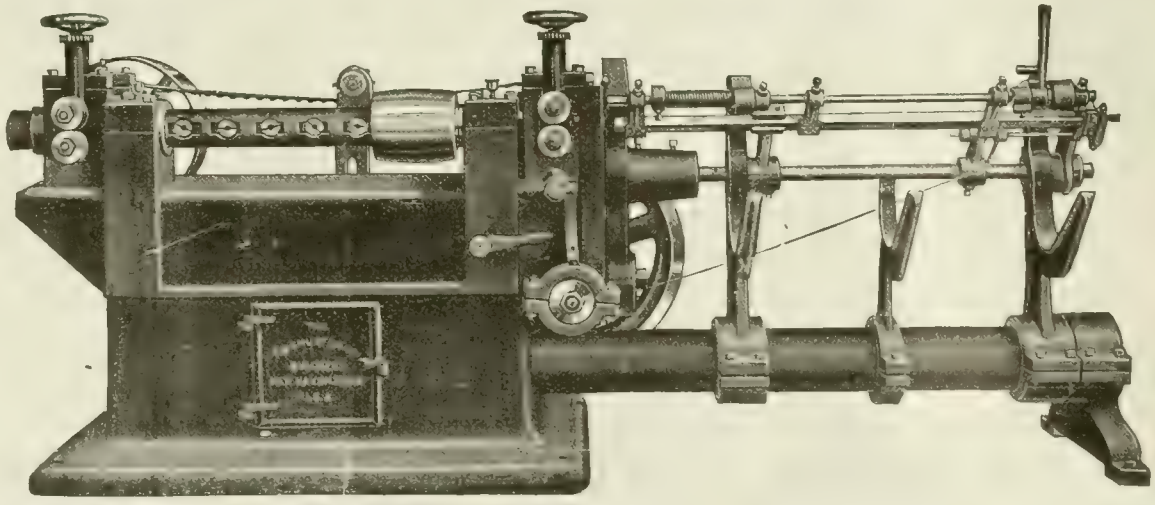
Your rush orders filled promptly by

The Galt Machine Screw Co., Limited

GALT, ONTARIO

Eastern Representatives:
Messrs. F. BACON & COMPANY
131 St. Paul Street West, Montreal, Que.

Western Representative:
Mr. D. PHILIP
138 Portage Avenue, Winnipeg, Man.



Perfect Wire Straightening Quickly and Profitably Done on Our

Automatic Wire Straightening and Cutting Machine

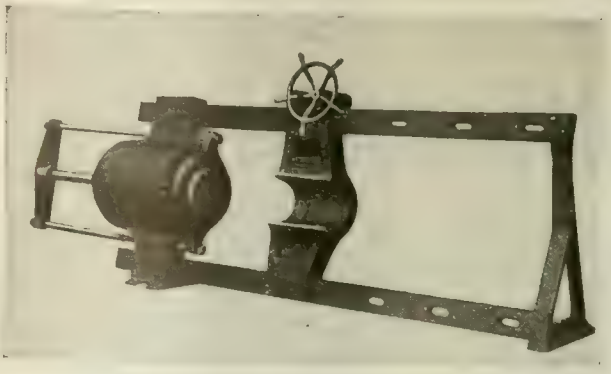
Just put your coil of wire on the reel, adjust the rolls and dies, and set the gauge for the length you want. The machine does the rest—thousands of feet per day, perfectly straight and cut to accurate lengths.

Catalogue tells more about them, and we will be glad to send you a copy.

THE F. B. SHUSTER CO., New Haven, Conn.

FORMERLY JOHN ADT & SON ESTABLISHED 1886

ALSO MAKERS OF STRAIGHTENERS FOR SQUARES, HEXAGONS, FLATS, ETC.



PERRIN
400-Ton Hydraulic Wheel Press

This Made-in-Canada Press is built to operate direct from Accumulator at 1500 pounds per square inch pressure.

Perrin for Reliability

WILLIAM R. PERRIN, LIMITED
TORONTO

WHY EXPERIMENT ?
WE DID IT FOR YOU YEARS AGO

IMPERIAL GENUINE

For Heavy Engines and Extraordinary Hard Work

HARRIS HEAVY PRESSURE

THE COPPER COATED CAKE

For Donkey Engines, Saw Carriages, Small Motors, Transmission Line Shafting and all steady heavy pressure duty.

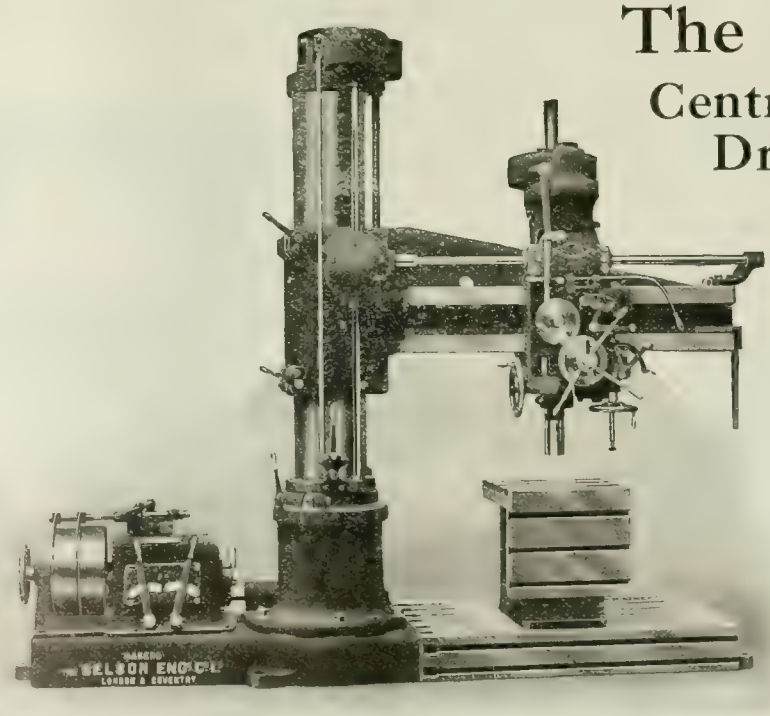
Matchless

Suitable For Slow-Moving Bearings

Write For Prices

THE CANADA METAL CO., LIMITED
TORONTO HAMILTON MONTREAL
WINNIPEG VANCOUVER

The "Selson"
Central Thrust Radial Drilling Machine



Do you appreciate the advantage of the Central Thrust? Write and we will explain.

SELSON
Engineering Co., Ltd.

SELSON HOUSE, 83 and 85 QUEEN VICTORIA STREET
LONDON, E.C. 4, ENGLAND. WORKS: COVENTRY
Branches: Paris, Brussels, Turin, Milan, Melbourne, New York

If interested tear out this page and place with letters to be answered.

MILWAUKEE MILLING MACHINES

Increase Your Dividends

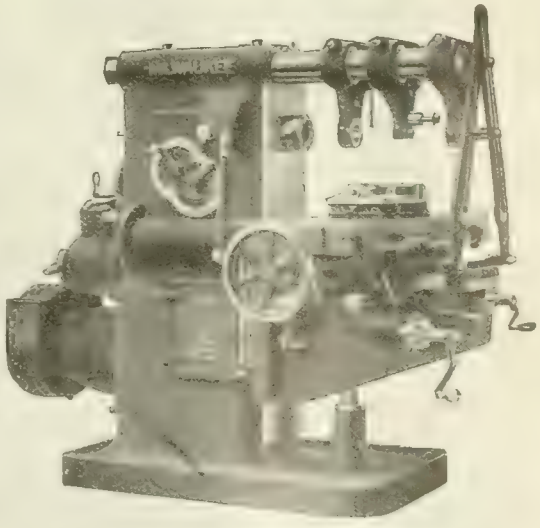
Economy and increase in quality and production of work follows the installation of—

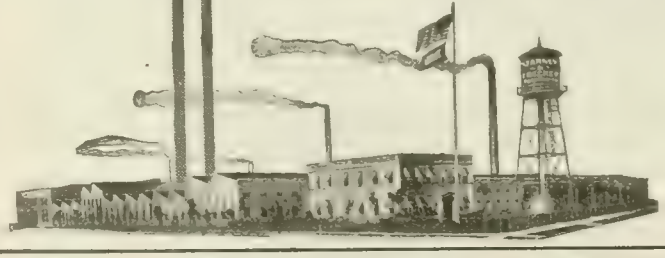
Milwaukee
Milling Machines

ECONOMY greater economy is the demand of the day. It will surprise you how profitably and economically the Milwaukee Milling Machine will do your milling.

"Milwaukee" engineers' forethought in superior design and construction, together with actual accomplishments, are responsible for the unprecedented choice of Milwaukee Milling Machines by leading manufacturers throughout the world. Unquestionable dependability to economically and efficiently meet the demands of production milling or work varying widely in character has won for them a memorable place in the hearts of discriminating mechanics and manufacturers.

Let us show you how you can cut your milling costs and increase your dividends. Permit us to send our catalogue as a forerunner.



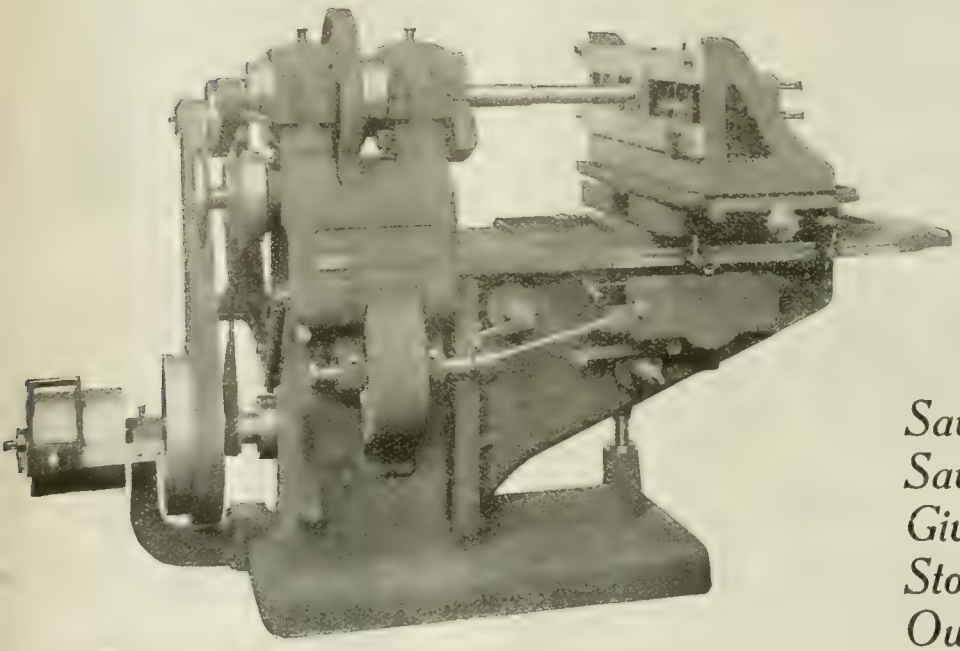


KEARNEY & TRECKER
CORPORATION
MILWAUKEE, WIS., U.S.A.

Canadian Representatives:
WILLIAMS & WILSON, LTD., Montreal
F. F. BARBER MCHY. CO., Toronto
A. R. WILLIAMS MCHY. CO., Vancouver and Winnipeg.

HEALD

New Business Possibilities



A real regrinding machine. See how easily it handles a six-cylinder en bloc.

Regrinding Cylinders

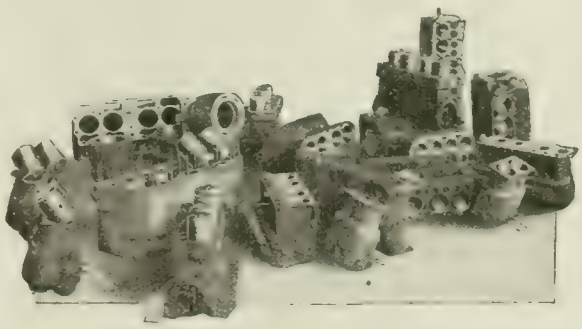
Saves Gas
Saves Oil
Gives More Power
Stops Smoking
Owners Demand It

Whether you are already interested in automobile repairing or are seeking some profitable business to go into, be sure to consider the regrinding of motor cylinders. Here is a new field of opportunity that has been barely scratched. With some thousands of registered cars that are being overhauled and whose worn and scored cylinders will require regrinding to bring back the original power, pep and economy of a new car, the possibilities are unequaled in any other business at the present time.

The Heald Style No. 55 has been just put on the market for this work. The capacity and range is such that it will handle all sizes and styles of cylinders usually found in the regrinding shop. It can be bought at a fair price, easy to set up, simple to run and maintain, with a capacity that will give you jobs you never planned on.

Some one in your vicinity is going to buy a Heald and get the cream of a profitable business.

Are you the one?



Handles all sizes and shapes of cylinders.

The Heald Machine Co.

51 New Bond Street
WORCESTER, MASS.

Branches at Chicago, Detroit, Cleveland, Buffalo, Cincinnati, Philadelphia and New York

If interested tear out this page and place with letters to be answered.

LARCUL CUTTING OILS Did the Trick

A large manufacturer of fittings recently had some malleable iron unions that were so hard they had to be annealed before they could be properly threaded.

The superintendent was very pessimistic and did not believe that any kind of cutting compound would keep his tools in shape to machine these castings. We assured him that Larcul Ebony and Amber Cutting Oils would "do the trick," and his letter to us proves that they did!

> "Machined up all the unions that we used to send back to be annealed and they were as hard as flint, and I never believed there was an oil made that would touch them until you sent us those oils and we cleaned up all the unions we had on hand which were giving us a great deal of trouble and the threads were as good as we are getting on our regular run of castings."

Larcul Cutting Oil is made in two grades: Amber, a transparent oil, for all types of automatics, turret machines, gear cutters, etc., and Ebony, for pipe and bolt threading, nut tapping, turrets, automatic turning and boring, etc.

Larcul makes the "impossible" job possible, and the regular job easier.

Let us give you a demonstration.

Cataract Refining Company
Limited
TORONTO ONTARIO

SCIENTIFIC LUBRICANTS for SCIENTIFIC LUBRICATION

1/3 to 1/2 Reduction in Milling Cost

This will be the result of taking small milling jobs from your big millers and putting them up to

The U.S. MILLER

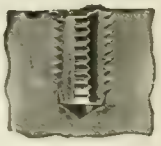
The Miller for Small Work

A small machine takes up less space, requires less power, is easier to operate and is more accurate.

The Paramount Miller of its size. Drop us a line for full details.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

Buried in the Work and Broke!



Next time a tap breaks below the surface of a large casting, don't let some makeshift method of removing it injure the thread and waste half an hour of valuable production time. Instead—

Walton it Out in a Jiffy

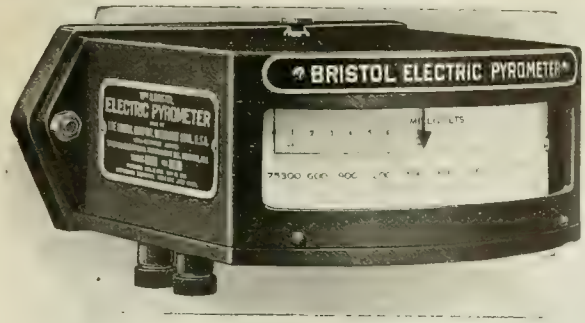
And save the casting.

Special analysis steel fingers of the Walton Extractor drop into the flutes of the broken tap—and grip. Then a few turns of a wrench applied to the squared end of the Extractor backs out the buried tap.

Sixty-day **trial offer** proves the Walton Extractor pays for itself.

Write.

The Walton Co.
Hartford, Conn.



ELIMINATE GUESS WORK
In Heat Treating

Heat-treating Furnaces equipped with BRISTOL'S Pyrometers assure perfect heat treated products through the elimination of all guess work.

The Patented Automatic Internal Cold End Compensator is an exclusive feature with Bristol's Pyrometers. It makes of every pyrometer a direct-reading instrument—no allowance to be made for cold and errors.

Get copy of Bulletin I-291.

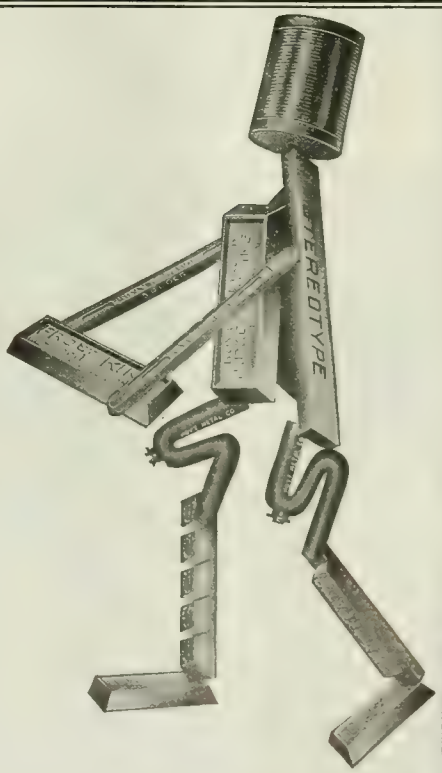
THE BRISTOL COMPANY
Waterbury, Conn.
Canadian Distributors: A. H. WINTER JOYNER, Toronto and Montreal

FROST KING BABBITT

will withstand heavy pressure without increasing its temperature.

For general machinery bearings it is without a peer.

If you are from Missouri try a sample lot and be convinced.



HOYT METAL COMPANY
MONTREAL TORONTO WINNIPEG

Franklin Die-Castings in Office Appliances

The Growing Needs of Business

Not long ago the steel pen was practically the only mechanical instrument used in transacting business. To-day typewriters, telephones, multigraphs, adding machines, filing cabinets, billing machines, stamp affixers and an ever-increasing list of other appliances meet the growing needs of business.

The Die-Casting Process is prominent among the manufacturing methods that have made possible this extraordinary development.

In 1892 we originated the Die-Casting Process, and for nearly thirty years we have been applying it to many fields of industry. Our long experience should be of value to progressive engineers.

We cast in Aluminum, Tin, Lead, and Zinc base alloys, and quote from samples or blueprints.

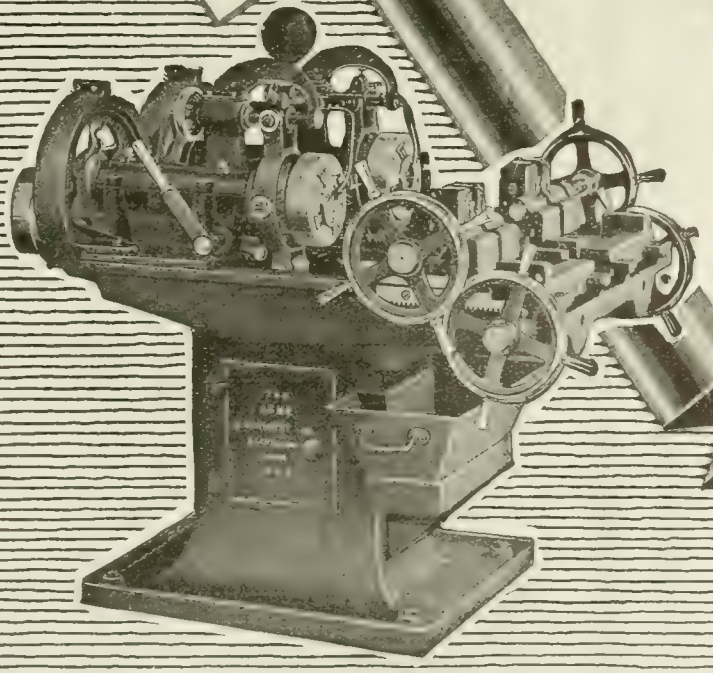
FRANKLIN DIE-CASTING CORPORATION
Gifford and Magnolia Sts., Syracuse, N. Y.

Write for booklet "Franklin Die-Castings in Many Fields."

FRANKLIN DIE-CASTINGS

BOLTS

SQUARE · HEXAGON · TEE-HEAD



Cut Them In Your Own Plant

and Save Money on Cost and Delay in Deliveries

ACME BOLT CUTTERS

are made in various sizes for cutting bolts from ¼ to 1 in. diameter. Their heads allow micrometer adjustments while they are in motion. The dies can be changed from one size to another in less than one minute and produce clean, accurate, highly-finished threads.

May we send catalog?

The Acme Machinery Co.

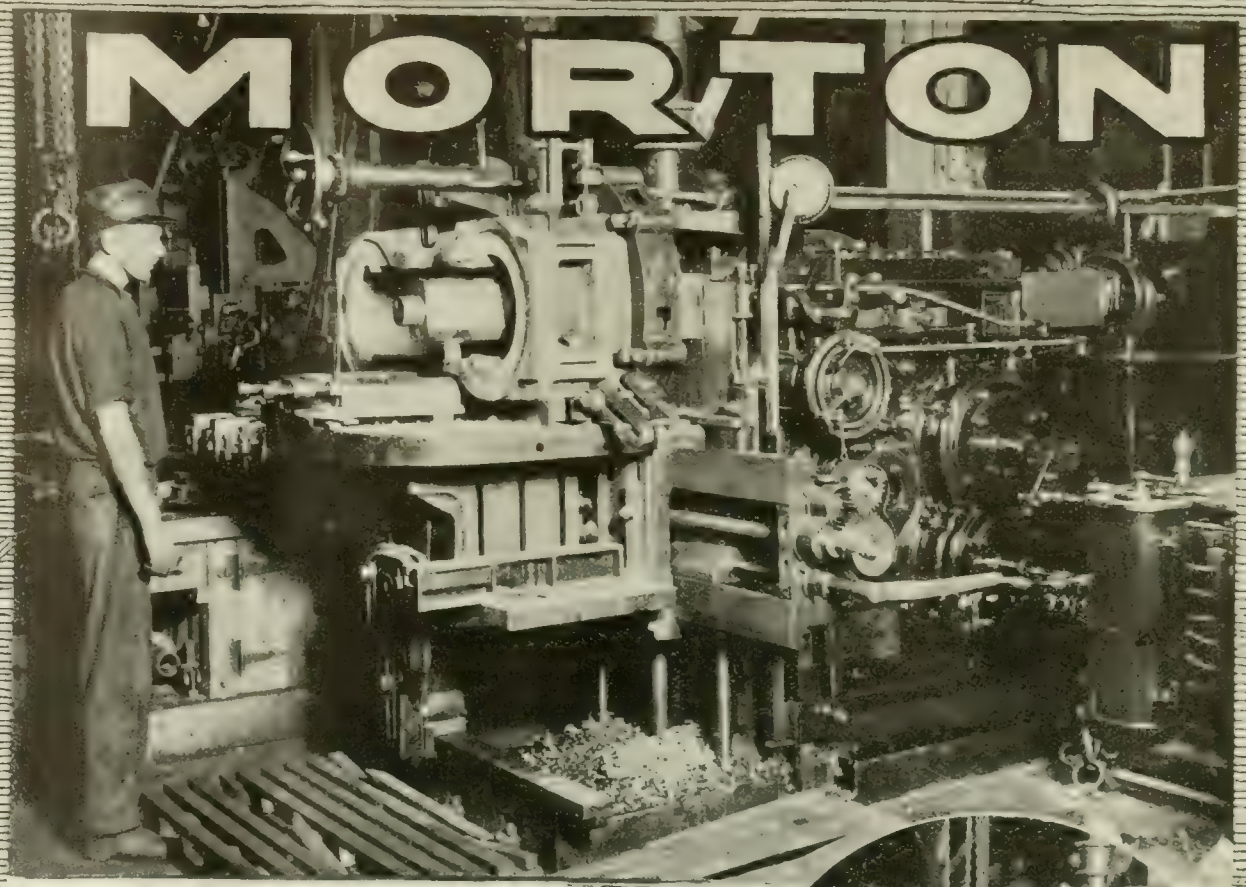
4530 St. Clair Ave. Cleveland, Ohio

We make a complete line of Bolts, Rivet, Heading, Upsetting and Forging Machines, Bolt Cutters, Hot Pressed Nut Machines, Hammer Heads, Bolt Pointers, Nut Tappers.

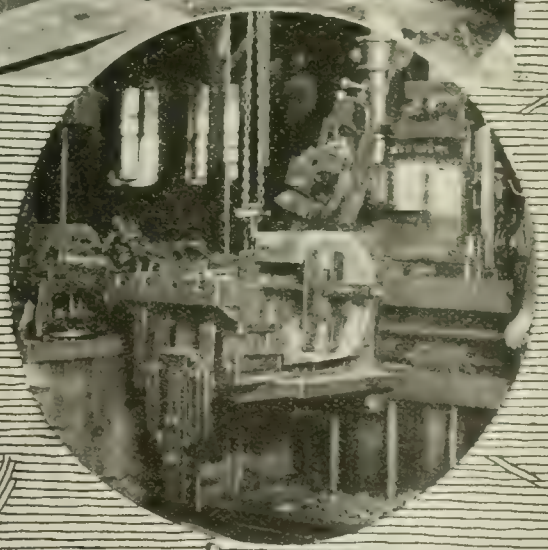
Representatives for Canada:
The John Bertram & Sons Company, Limited, Dundas, Ont.

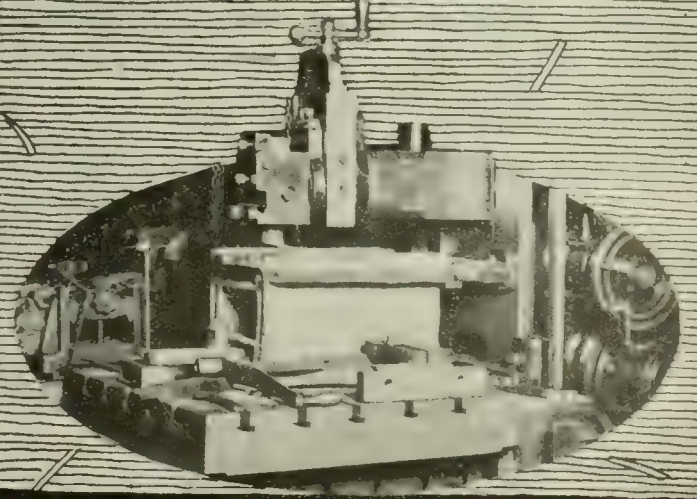
ACME BOLT CUTTERS

MORTON



Increased Driving Box Repairs Forced the Purchase of this Morton Draw Cut Shaper





Delays to output were traced direct to driving box repairs in this busy shop. Time element and shortage of man power were considered and the installation of this "Morton" reflects the good judgment of these thoughtful officials to install machines of guaranteed production power.

This Morton handles all the machine work on driving boxes—planing to thickness, planing shoe and wedge faces and crowning for bearing brass. It simplifies handling and reduces machine time.

May we send Bulletin A-6 explaining numerous points of merit?

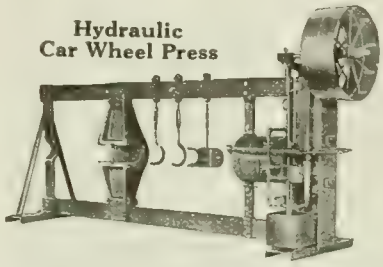
MORTON MFG. CO.

Muskegon Heights - Michigan

LOURIE HYDRAULIC PRESSES

For Every Purpose Requiring Pressure

Hydraulic Car Wheel Press



We manufacture a complete line of presses for bending, straightening, forcing, forming, broaching, welding, baling, and many other purposes.

Hydraulic Bulldozer

Write for Catalogue

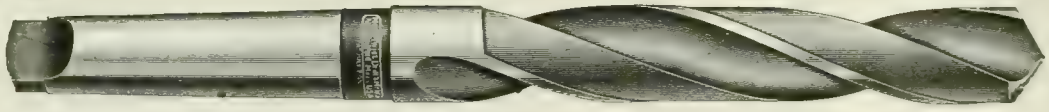
LOURIE MANUFACTURING CO.
SPRINGFIELD, ILLINOIS, U.S.A.

"MORSE" DRILLS

BOTH CARBON AND HIGH-SPEED

Have always maintained a

High Grade of Efficiency



We still use the best material in their manufacture and stand back of every drill we put out. **If you want the best, use**

Morse Twist Drill & Machine Co.
New Bedford, Mass.
U. S. A.

"MORSE"

THE MORSE CHAIN CO.

are the
Largest Manufacturers in the world
of
High Speed Silent Chains

Why?

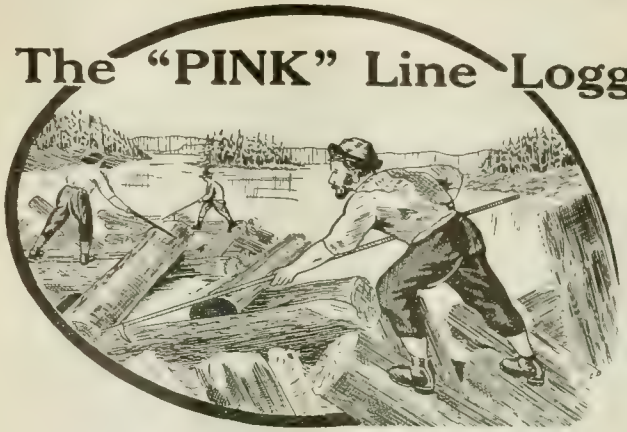
Morse Chain possesses the exclusive
Rocker Joint
Frictionless—Requires no Oilbath.

Jones & Glassco (Reg'd.)
Canadian Agents
Montreal - - Toronto

80 H.P. Morse Drive to Rolls, reverses direction every 45 seconds

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

The "PINK" Line Logging Tools and Handles



MADE-IN-CANADA Products---Headquarters for British Empire for all Lumbering Tools

In every lumber camp in Canada you'll find PINK'S famous lumbering tools. They are the favorites there and have won the esteem of all woodsmen through their superior merit. They are world-renowned and are extensively used in Australia, New Zealand and other countries where the lumbering industry thrives.

EXPORTERS TO EUROPE

We export the same good quality of lumbering tools that have made PINK'S TOOLS a by-word in the matter of good tools in all Canadian lumber camps. Enquiries cordially solicited.

Thomas Pink Co., Limited

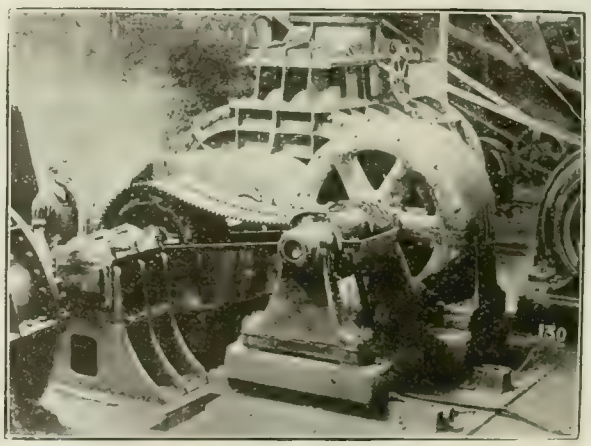
PEMBROKE, ONT., CANADA

RENOLD DRIVING CHAINS

(THE CHAINS OF UNIVERSAL REPUTE)

ONE
QUALITY ONLY—
THE BEST

OUR POLICY SINCE
1879



RELIABLE, COMPACT,
EFFICIENT and DURABLE

Note particularly compact features of 350 H.P. Renold Silent Chain Drive to Roots Pressure Blower.

If YOU are interested in increasing YOUR Production, also improving the Quality of YOUR product, YOU MUST consider

RENOLD DRIVING CHAINS FOR POWER TRANSMISSION

WRITE FOR BOOKLET NO. 200/5—"NOTES ON SELECTION OF CHAIN GEAR."

HANS RENOLD of CANADA, LIMITED

11 ST. SACRAMENT STREET
MONTREAL

32 FRONT STREET W.
TORONTO

An Easy Master of Big Jobs

SIDNEY

Heavy Duty Engine Lathes

The surplus strength and rigidity of the Sidney makes it the ideal lathe for the "Big Job."

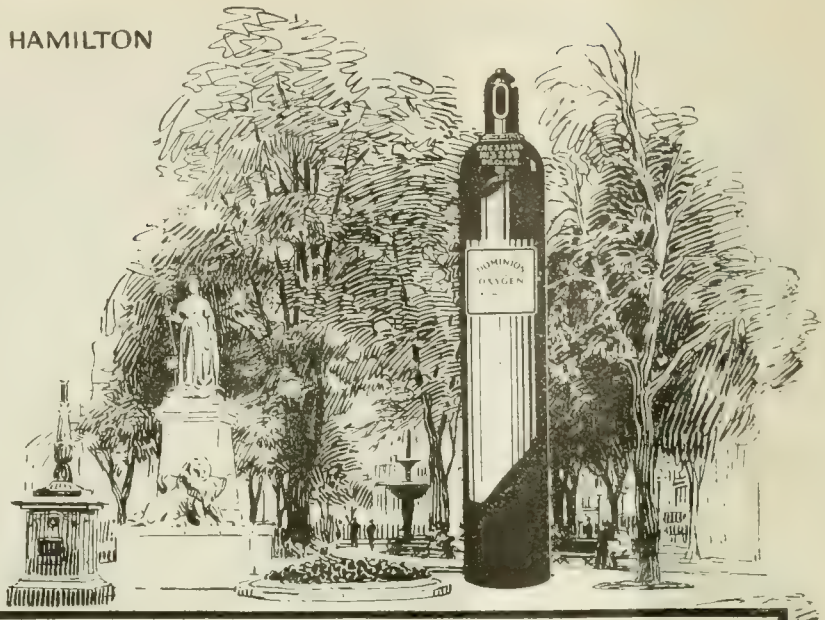
Illustration shows 25-inch Heavy Duty, Quick Change. Bed lengths in 10, 12, 14, 16, 18 and 20 feet. Write for details.

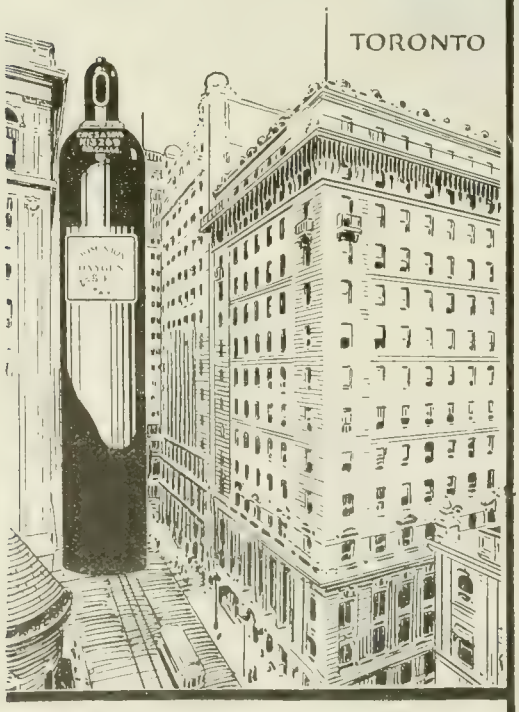
The Sidney Tool Company, Sidney, Ohio, U.S.A.

Canadian Agents

Yeates Machinery & Supply Co., Montreal, Que. H. W. Petrie, Limited, Toronto, Ont.

If interested tear out this page and place with letters to be answered.





Dominion Oxygen

when and where you want it

FROM four centrally located points the Dominion Oxygen Company, Limited, supplies Canadian industry with the commercial oxygen it needs. Thanks to the completion of these first four distributing stations, Canadian manufacturers can now rely on a never-failing source of immediate oxygen supply.

Delivery of pure oxygen in any quantity, at any point, at any time, is made certain by Dominion's producing and distributing organization.

The manufacture of uniformly pure oxygen in quantities large enough to insure prompt attention to your needs has been the aim of the Dominion Oxygen Company, Limited, since the formal announcement of its building plans. The fact that every order for oxygen is filled on the day it is received is evidence of the efficiency already reached.

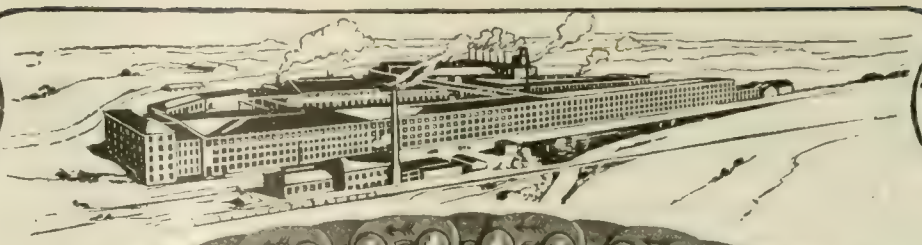
Dominion Oxygen Service is based on the Company's realization of Canada's need of an always available supply of uniformly pure oxygen. Dominion oxygen, in the high capacity cylinder built for economical and safe handling, fills that need.

DOMINION OXYGEN COMPANY, LIMITED

Hillcrest Park, Toronto

Hamilton Montreal Windsor

D-15



The Sign of Efficiency — The Sign of Durability

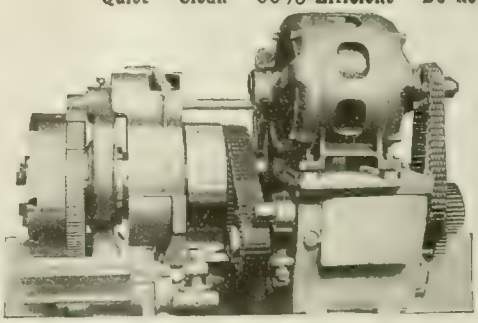
MORSE DRIVES

THE MORSE RUCKER JOINT

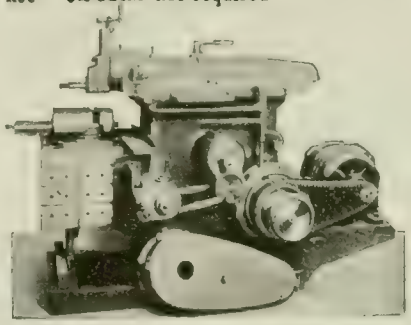
Positive as Gears — Flexible as a Belt

Longer Life

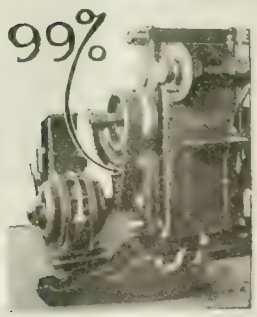
Quiet Clean 99% Efficient Do not run hot Oil baths not required



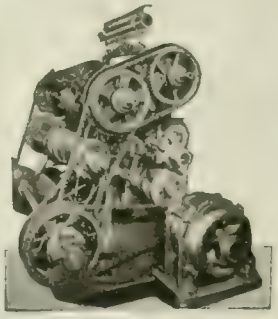
Typical Example: Morse Silent Chain as positive speed ratio drive in head of Gisholt lathe



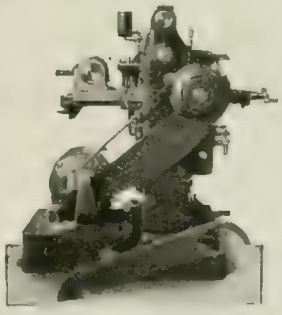
Morse Silent Chain driving Hendey Shaper from Individual Motor



Individual Motor driving Milling Machine. Chain case removed



Seven Morse Silent Chain Drives giving positive speed ratios in Automatic Hub Machine



Morse Silent Chain Drive from Individual Motor to Cincinnati Milling Machine. Chain case removed

THAT the Advantages of Morse Drives merit careful investigation by manufacturers requiring individual motor drives or silent drives of positive speed ratio is shown by the constantly increasing number of prominent designing engineers standardizing on Morse Silent Chain Drives.

Our Sales Engineers are Power Transmission Experts who make it their business to design the drive that gives best efficiency.

MORSE CHAIN CO., LARGEST MANUFACTURERS OF SILENT CHAINS IN THE WORLD **ITHACA, N. Y.**

Morse Engineering Service — *Assistance Without Obligation*

Address Nearest Office

BALTIMORE, MD. . . . . 1402 Lexington Bldg.
BOSTON, MASS. . . . . 141 Milk Street
CHICAGO, ILL. Merchants Loan & Tr. Bldg
CLEVELAND, OHIO . . . . . Engineers Bldg.
DETROIT, MICH. . . . . Cor. 8th & Abbott Sts.
CHARLOTTE, N. C. 404 Commercial Bk. Bldg.
NEW YORK CITY
50 Church St., Hudson Term. Bldg.
PITTSBURGH, PA. . . . . Westinghouse Bldg.
PHILADELPHIA, PA. . . . . 302 Harrison Bldg.
SAN FRANCISCO, CALIF. . . . . Monadnock Bldg.
ATLANTA, GA., Earl F. Scott, M. E. . . . . 702 Candler Bldg.
CANADA . . . . . Jones & Glasco, Reg'd.
MONTREAL . . . . . St. Nicholas Bldg.
TORONTO . . . . . Traders' Bk. Bldg.
KANSAS CITY, MO., Morse Engineering Co . . . . . Finance Bldg.
MINNEAPOLIS, MINN. . . . . Strong-Scott Mfg. Co. 413 Third St., S.
ST. LOUIS, Mo., Morse Engineering Co. . . . . Chemical Bldg.

"Morse" is the Guarantee Always Behind the Efficiency, Durability and Service

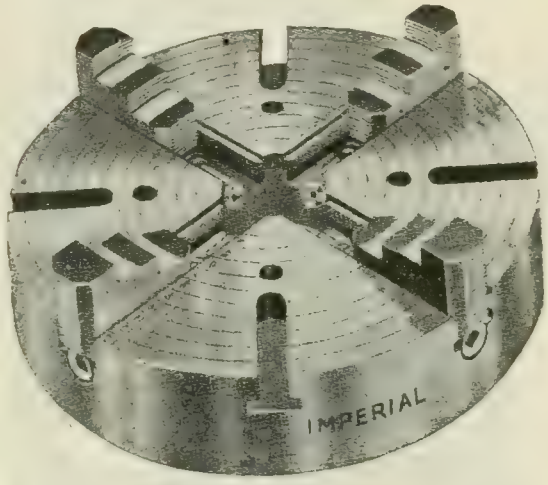
If interested tear out this page and place with letters to be answered.

IMPERIAL LATHE CHUCKS

Highly Endorsed by Canada's Best Manufacturers

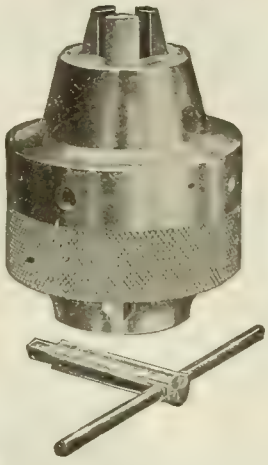
Sturdy long-wearing "Made-in-Canada" Chucks that are making good everywhere.

Specify them in your next order.



Ker & Goodwin Machinery Co.
BRANTFORD, Ont. LIMITED

Built For Production Not For Price



The Skinner Geared Pattern Drill Chuck has no superiors and few, if any, equals. It is as accurate as it is convenient. The gears being enclosed beneath the surface, there is no danger of pinched fingers.

Made of steel throughout, this chuck is operated by hand, the final grip being secured by a mere turn of the wrench.

THE SKINNER CHUCK COMPANY

NEW BRITAIN, CONN U S A

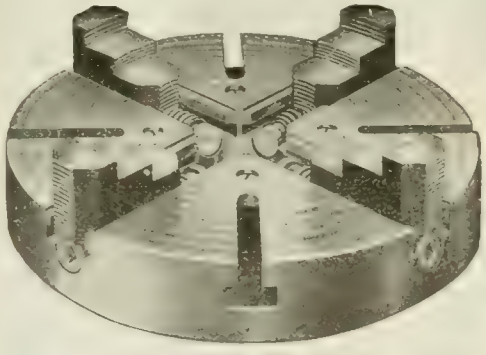
ESTABLISHED 1887

NEW YORK OFFICE: 94 READE ST.
SAN FRANCISCO OFFICE: RIALTO BLDG.
LONDON OFFICE: 139 QUEEN VICTORIA ST., LONDON, E.C.4.

ALL STEEL

INDEPENDENT CHUCKS

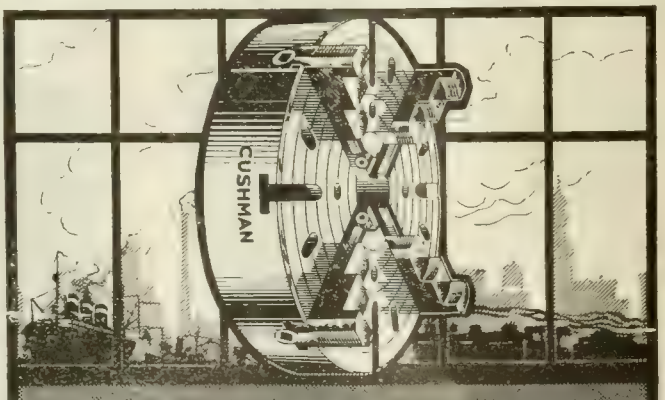
are not an experiment — they have come to stay. They are a necessity with the modern machinery and high-speed steel cutting tools.



THE UNION STEEL BODY CHUCKS

are well designed and have all the elements of strength and durability for which they are designed. We make other types in steel also, including the Geared Scroll Chucks and the Geared Scroll Combination—all designed for heavy work and hard usage.

UNION MANUFACTURING COMPANY
New Britain, Conn.
New York Office: 26 Cortlandt Street
Makers of a complete line of chucks



THE CHUCK WITH A REPUTATION TO MAINTAIN

"CUSHMAN" CHUCKS 1862

THE CUSHMAN CHUCK CO.
HARTFORD, CONN.

NAMCO
THREAD-CUTTING
DIES

THREE REASONS—

Three reasons for the continuously accurate threads cut by NAMCO Self-Opening Dies are correct design, careful workmanship, excellent materials.

There's a NAMCO Die for every requirement.

THE NATIONAL ACME COMPANY

CLEVELAND, OHIO

New York Boston Chicago Detroit Buffalo Windsor, Vt. Montreal

VENUS PENCILS

The largest selling Quality pencil in the world

THE well-known VENUS pencil with the water-mark finish—there is an individuality, a luxury, a satisfying quality, about its smooth firm, gritless leads, that make the engineer always say: "Here, indeed, is Pencil Perfection."

17 Black Degrees
3 Copying

For bold, heavy lines
6B-5B-4B-3B

For writing, sketching
2B-B-HB-F-H

For clean, fine lines
2H-3H-4H-5H-6H

For delicate, thin lines
7 H-8H-9H

Plain Ends, per doz. $1.50
Rubber Ends, per doz. $1.75

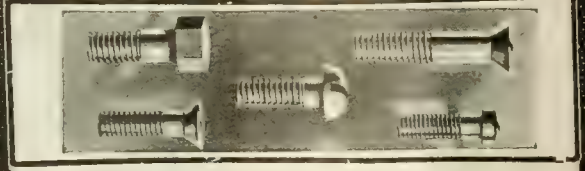
At Stationers and Stores throughout the World

American Lead Pencil Company
238 Fifth Ave., New York

Factory: Hoboken, U.S.A.
Factory: London, Eng.

Wood Screw Making Machinery

SEND FOR CATALOGUE
Series



For sixty years we have constantly manufactured machinery for making screws, always studying to improve and refine our product.

Write or Wire us.

Cable address: "Cook,"
Hartford, U.S.A.
Codes: Liebers
Western Union

Asa S. Cook Co.
Hartford, Conn.

KELLER-MASTER

KELLER-MASTER
ROTARY GRINDER

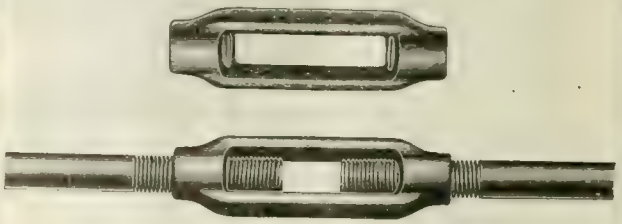
Ten pounds lighter, yet more rugged than other types with same power and speed—free from vibration, which insures endurance in operator and tool—ample power to sustain speed under load—are the salient features of the NEW Keller-Master Rotary Grinder.

KELLER-MADE
MASTER-BUILT

KELLER
PNEUMATIC TOOL COMPANY
GRAND HAVEN, MICHIGAN
BANK OF NOVA SCOTIA BLDG., MONTREAL

CANADA
FOUNDRIES & FORGINGS
LIMITED

Drop Forged Steel

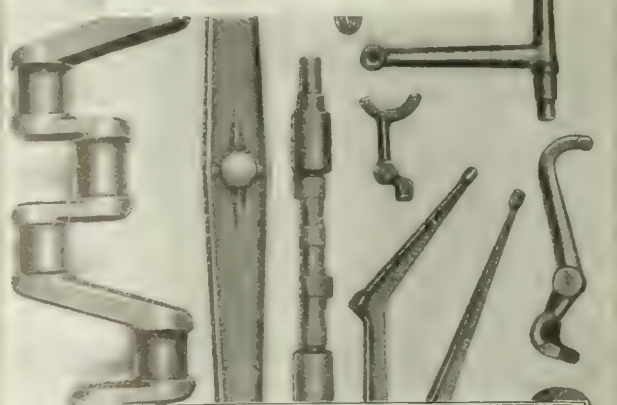


SOLID—NOT WELDED

16 Sizes with / without } Stubs

Canada Foundries & Forgings
Welland, Ont.

DROP FORGINGS
Are sometimes cheaper than castings—Always far superior.



DROP FORGINGS
F & S Co.
One of the Largest and Best Equipped Plants anywhere.
Consult us as to your requirements.
Dominion Forge & Stamping Co., Limited
Walkerville, Ontario
Toronto Office · Excelsior Life Building

THERE is as much difference in the various makes of High Speed Steel as there is in men—

The practice and methods of manufacturers differ widely in every mill and anyone who is at all familiar with the manufacture of High Speed Steel thoroughly understands this

"Red Cut Superior"

The Nationally Known—First Quality

HIGH SPEED STEEL

is the best for all Machine Work

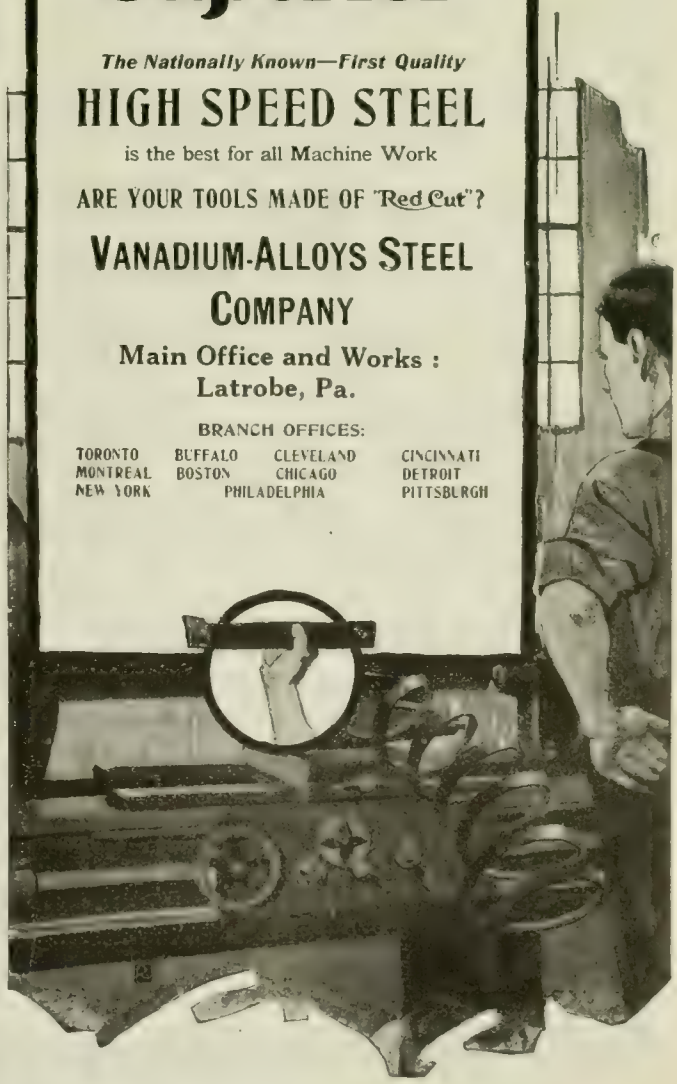
ARE YOUR TOOLS MADE OF "Red Cut"?

VANADIUM-ALLOYS STEEL COMPANY

Main Office and Works :
Latrobe, Pa.

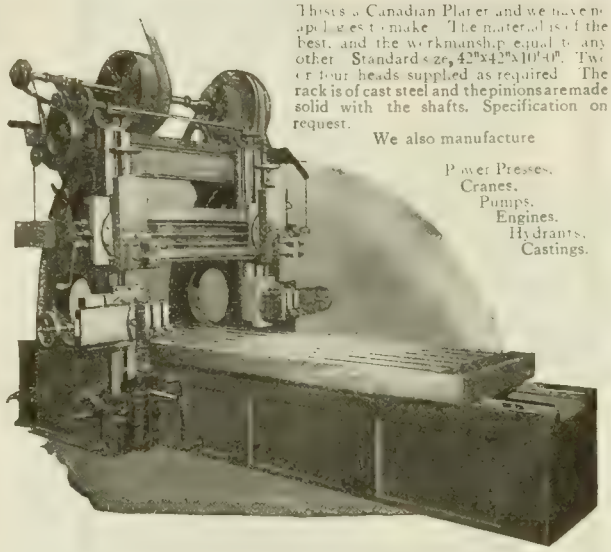
BRANCH OFFICES:

TORONTO	BUFFALO	CLEVELAND	CINCINNATI
MONTREAL	BOSTON	CHICAGO	DETROIT
NEW YORK		PHILADELPHIA	PITTSBURGH



If interested tear out this page and place with letters to be answered.

HEPBURN
HIGH-SPEED PLANER



This is a Canadian Planer and we have no apologies to make. The material is of the best, and the workmanship equal to any other. Standard size, 42"x42"x10'-0". Two or four heads supplied as required. The rack is of cast steel and the pinions are made solid with the shafts. Specification on request.

We also manufacture

Power Presses.
Cranes.
Pumps.
Engines.
Hydrants.
Castings.

John T. Hepburn, Limited

Engineers and Iron Founders

18-60 Van Horne St., Toronto, Ontario, Canada

The FORD TRIBLOC

A Chain Hoist that gives perfect service

Catalog sent upon request

FORD CHAIN BLOCK CO.
2ND & DIAMOND STREETS PHILADELPHIA, PA.

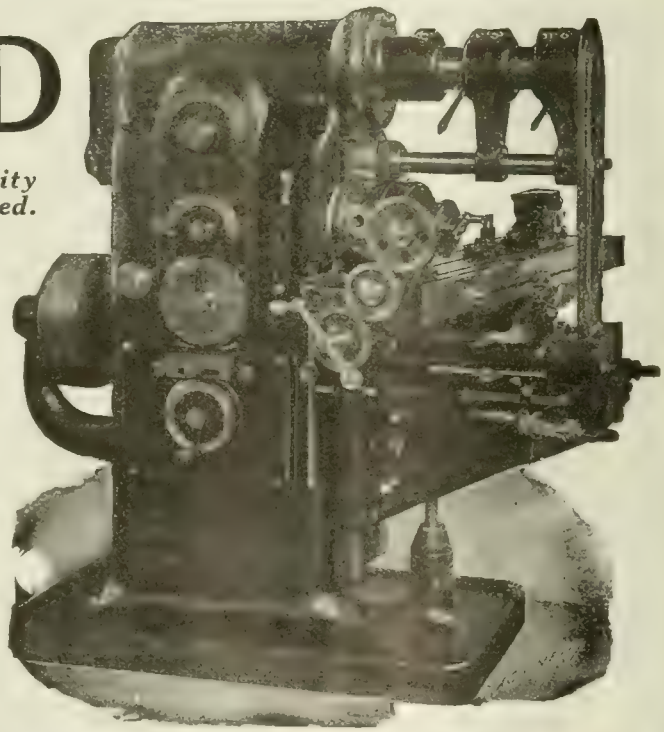
OVER SEAS REPRESENTATIVE
ALMACOA ALLIED MACHINERY COMPANY OF AMERICA ALMACOA
51 CHAMBERS ST. NEW YORK U.S.A.

PARIS BRUSSELS TURIN BARCELONA RIO de JANEIRO

Saves Time, Labor, Expedites Production

ROCKFORD Milling Machine

Its speed, simplicity of operation and great utility Assures Big Profits in whatever work it is used.



And another profit-making feature of the "Rockford" Miller lies in its unusual capacity to do all classes of work.

In the tool room, in the shop, in the manufacturing or jobbing establishment this "Miller" is beyond comparison.

Has Power to Spare

Put the power of the "Rockford" to the severest tests. It's built to more than meet the demands likely to be made upon it. It is the pace-maker of the machine shop.

Look into the merits of this machine. Write to us without delay.

ROCKFORD MILLING MACHINE COMPANY, ROCKFORD, ILL.

Canada: Rudel-Belnap Machinery Co., Toronto, Ontario.

FOREIGN REPRESENTATIVES: Great Britain, A. A. Jones & Shipman, Ltd., Leicester, England. France and Belgium, Louis Besse, Paris, France. Italy and Colonies, Societa Anonima Adler & Co., Milano. Scandinavia, Rylander & Asplund, Stockholm, Sweden. Spain and Portugal, Casamitjana Hermanos, Barcelona, Spain. Australia, Selson Engineering Co., Melbourne, Australia. Russia, M. Metz Engineering Co., Petrograd, Russia.

NOVO-SUPERIOR

HIGH SPEED STEEL
INTRA STEEL GIBRALTAR STEEL
Tool Steel for Every Purpose
Swedish Lancashire Iron

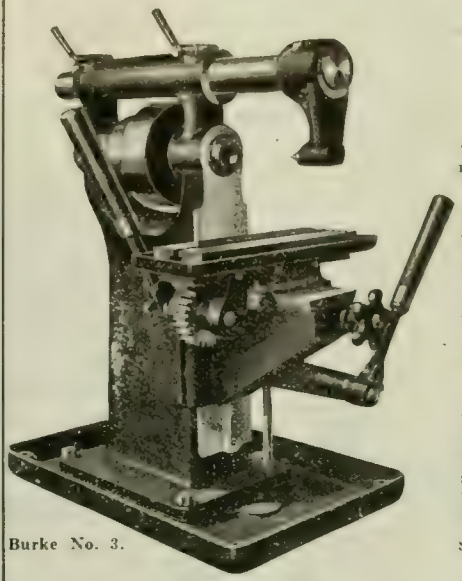
Twist Drills, Taps, Hack Saw Blades, Milling Cutters,
Files, Etc., Music Wire for Springs, Steel Balls.
Cold Rolled Tool Steel in Strips and Sheets,
Circular Saws, Machine Knives.

PILOT STEEL & TOOL COMPANY,
LIMITED
332 St. James Street, Montreal

Sole Agents for
JONAS & COLVER, LIMITED
Novo and Continental Steel Works,
Sheffield, Eng.
H. BOKER & CO., Inc.
New York, N.Y.

It pays to use high-grade machine tools

THIS HAND FEED MILLER



Burke No. 3.

$155
Canadian
Moneys

This accurate little machine will soon pay for itself in the variety of jobs it will handle. It will economically take care of much of the work usually done on the large machines In these days of high priced machinery this is worth considering.

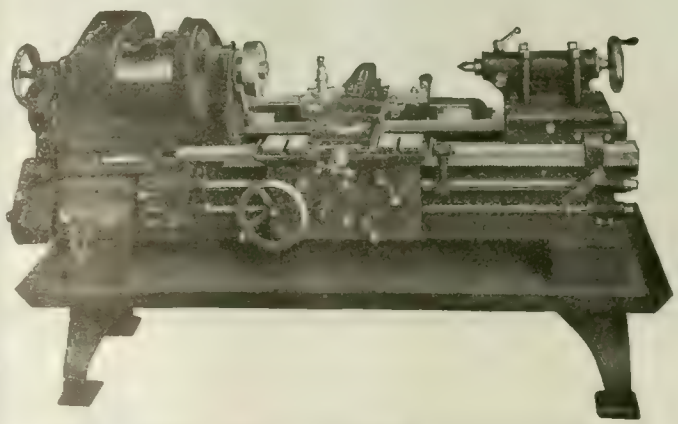
Catalog shows other sizes of milling machines, both hand and power feed, with or without overhanging arm, bench or column type, also Tapping Machines, Drill Presses, and Cold Saws.

THE BURKE MACHINE TOOL CO.
520 Sandusky St., Conneaut, Ohio, U.S.A.

Canadian Dealers:—H. W. Petrie Ltd., National Machinery & Supply Co., A. R. Williams Machinery and Supply Co., Canadian Fairbanks-Morse Co., Williams & Wilson, Garlock-Walker Machinery Co., Yeates Machinery Co., Cope & Sons, Geo. F. Foss Machinery & Supply Co.

"LEHMANN LATHES"

Will Put the Same Degree of Efficiency Into
Your Shops as They Have in Many Others



TWO SIZES—16", Swing 18¼" and 18", Swing 20¼"

Because they are constructed "right" of the best material, workmanship and design, and therefore are adaptable to all conditions, whether it be work requiring accuracy to the highest standards or for the heavy duty where power, strength and rigidity are required.

Convince yourself of these facts! Let us send you complete specifications of this superior lathe and the names of some of the larger concerns who are using "LEHMANN LATHES" for better results.

We know you are interested, so don't put off writing us. Do it to-day. Now!

LEHMANN MACHINE COMPANY, 3566 CHOUTEAU AVE. ST. LOUIS, U.S.A.

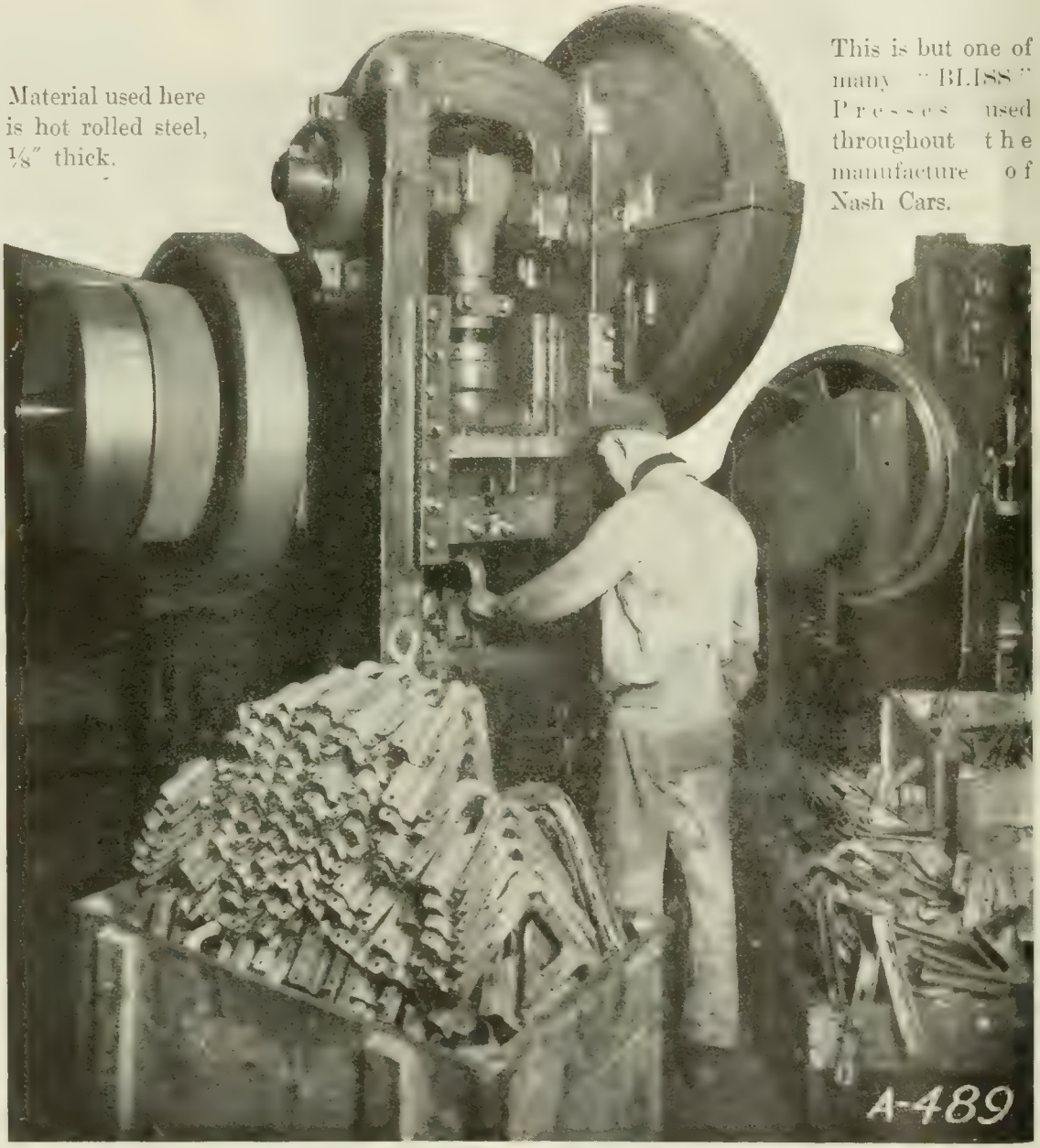
If interested tear out this page and place with letters to be answered.

Spring Run-Board Hangers

This "BLISS" No. 74½ Straight Side Press, at the Nash Motors Co. plant, Kenosha, Wis., forms the clearance on 350 of these spring run-board hangers per hour.

Material used here is hot rolled steel, ⅛" thick.

This is but one of many "BLISS" Presses used throughout the manufacture of Nash Cars.



BLISS 1857

E. W. Bliss Company

Main Offices: BROOKLYN, N. Y., U. S. A.

American Factories: BROOKLYN, N. Y.; HASTINGS, MICH.; CLEVELAND, O.; SALEM, O.

BLISS 1921

SALES OFFICES

CHICAGO, People's Gas Bldg. DETROIT, Dime Bank Bldg. CLEVELAND, Union Bank Bldg.
CINCINNATI, Union Trust Bldg. BUFFALO, Marine Bank Bldg. ST. LOUIS, Boatmen's Bank Bldg. PITTSBURGH, Keenan Bldg.

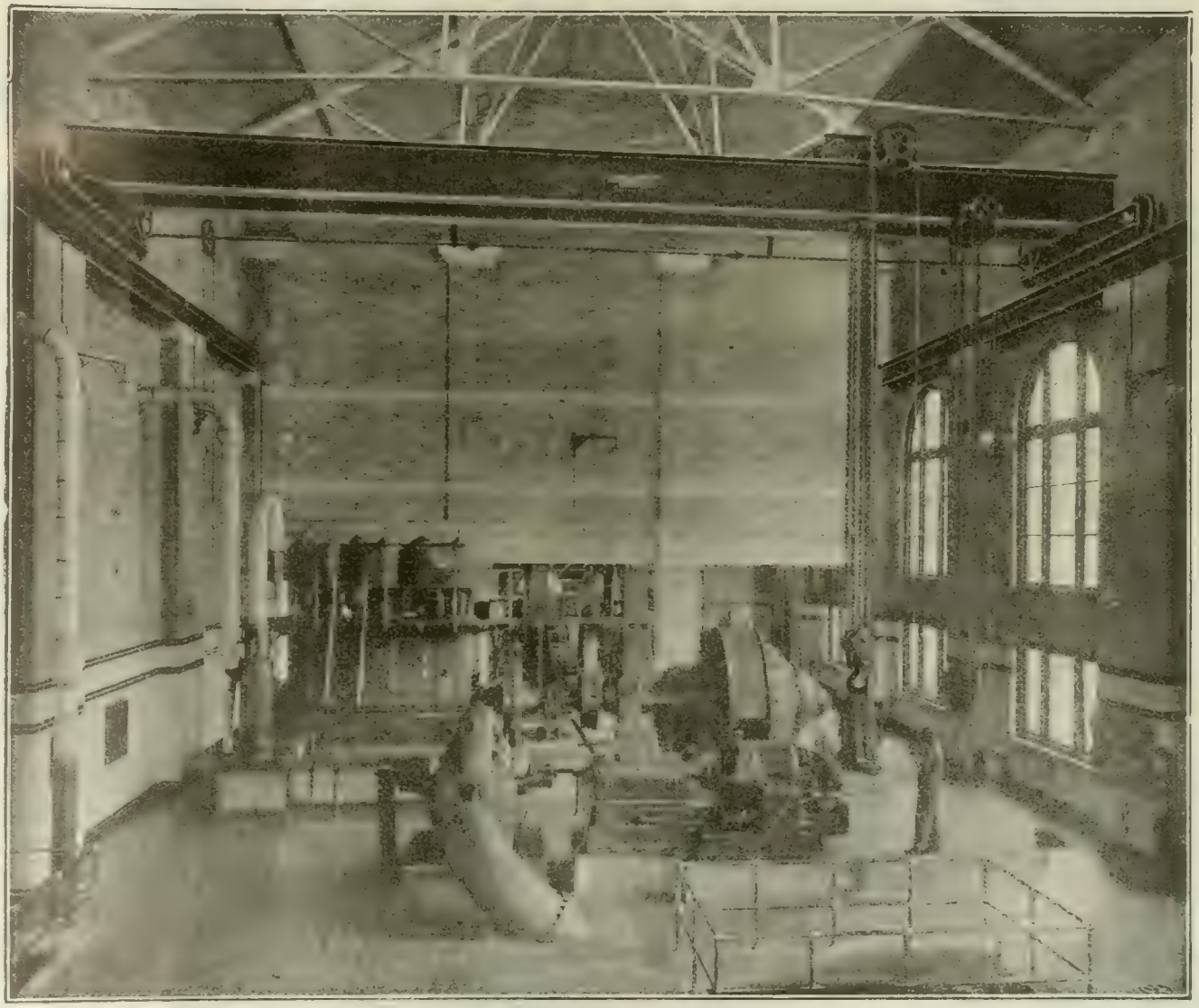
FOREIGN SALES OFFICES *and* FACTORIES

LONDON, ENGLAND, Pocock Street, Blackfriars Road, S. E. PARIS, FRANCE, 100 Boulevard Victor-Hugo, St. Ouen

108

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

MORRIS CRANES



STRENGTH AND EFFICIENCY

Together with easy operation keep Morris Cranes and Hoists on the job.

They will save you money — save your time — and increase your plant production.

There's a type to meet your particular needs.

ELECTRIC AND HAND OPERATED OVERHEAD CRANES

THE HERBERT MORRIS CRANE & HOIST COMPANY, LIMITED

Head Office and Works:
NIAGARA FALLS, CANADA

CHAIN BLOCKS
JIB CRANES
RUNWAYS

If interested tear out this page and place with letters to be answered.

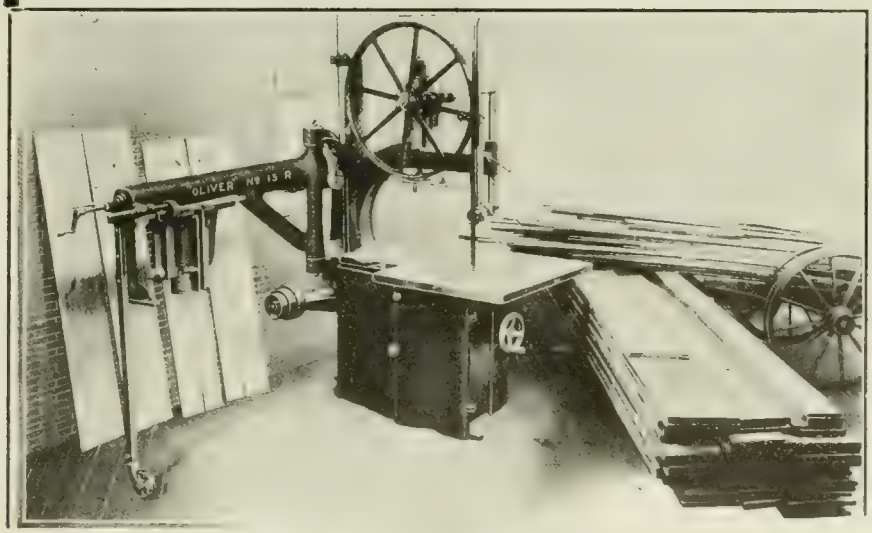
HANNA

IRON ORE - PIG IRON

Sales Agents:

Cleveland Cincinnati Pittsburgh Toronto Buffalo Detroit

The Oliver Combination Band Re-Saw and Scroll Saw



Photograph shows one of the many installations of a general utility tool of more than ordinary merit, both as a Re-Saw and as a Scroll Saw.

It has many excellent features of construction and design, and especial attention has been devoted to making the entire equipment as safe for the operation as modern safety appliances could devise.

Special literature on this and other "Oliver Quality" Wood Working Machinery and Pattern Shop Equipment

Oliver Machinery Company

Grand Rapids, Michigan, U.S.A.

CUT GEARS

Theoretically Correct

PROMPT SERVICE

ROBERT GARDNER & SON

LIMITED

52 NAZARETH ST., MONTREAL, P. Q.

RAWHIDE OR METAL

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Announcement

GENERAL Combustion Co. of Canada, Limited, have much pleasure in announcing that they have completed arrangements with T. H. Watson & Co., Sheffield, England, under which they will enjoy exclusive rights in Canada and Newfoundland to manufacture and sell the various Electric Smelting, Melting and Refining Furnaces which Watson & Co. have perfected.

THE Canadian rights for the "Greaves-Etchells" type of furnace, which has been widely adopted in the United States, England, France and Spain are also included in the arrangements made.

THE General Combustion Co. of Canada are also taking over the designs of the Electric Furnace Construction Company, Philadelphia, on their various types of electrically-heated Core Ovens, Annealing and Heat Treating Furnaces, and will have the active co-operation of the American Company on electric furnace problems generally.

General Combustion Company of Canada, Limited

619-623 New Birks Bldg.
MONTREAL

"Industrial Furnaces for Every Duty"

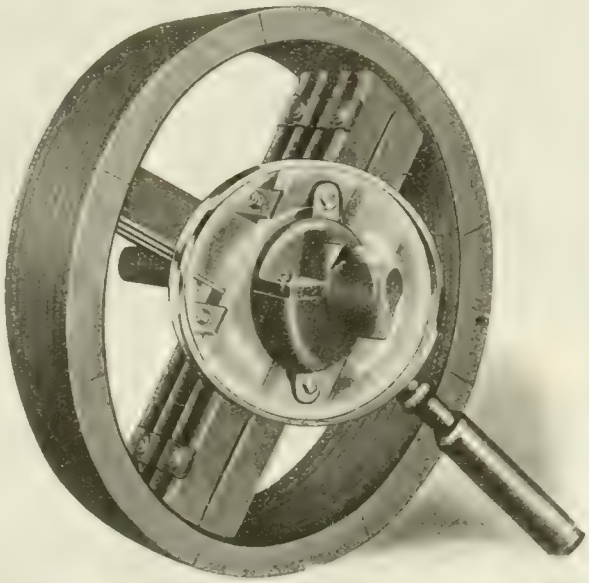
BERNARD
Wood Split Pulleys

Save Power

Wood Split Pulleys are lighter and they have an efficient Belt Gripping Surface

With the installation of Bernard Wood Split Pulleys you start on the road to lower overhead. Their cost is low.

Safety **Satisfaction**



BERNARD SAFETY COLLAR

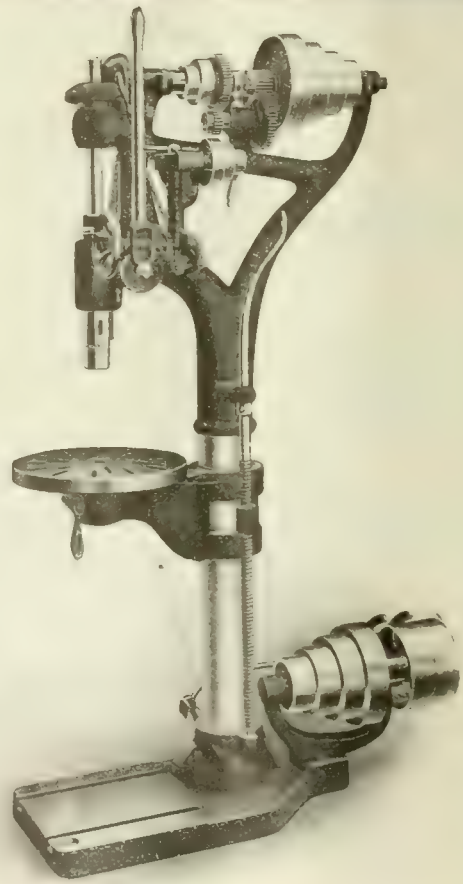
Put them to the test.

The A. Bernard Industrial Co.

Manufacturers of High-Grade Power Transmission Appliance

Office and Works: Fortierville, Que., Canada

DENBIGH DRILLING MACHINES



BUILT IN FOURTEEN SIZES

By the aid of a very efficient plant and organization, we manufacture these machines in large numbers by mass production.

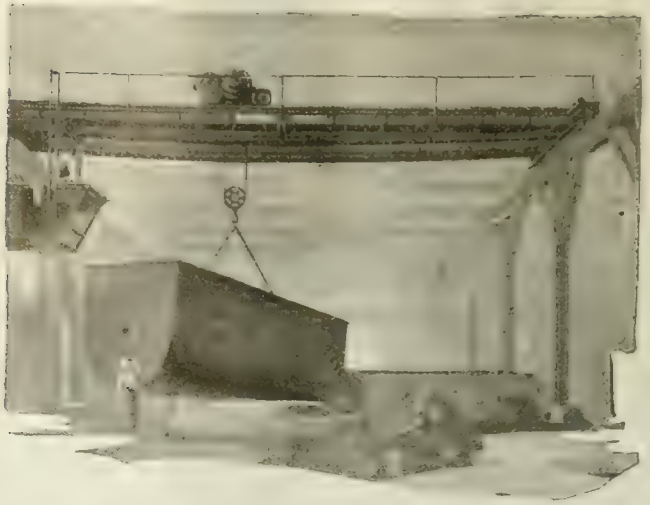
Prices and Deliveries are Right

John M. Terry & Co.

85 Newington Causeway, London, S.E. 1.

CABLES—ATHENIAN, SEDIST, LONDON

SHEPARD
ELECTRIC CRANES & HOISTS



With ease and precision

A Shepard Electric Traveling Crane will pick a tonnage piece and quickly convey it to any part of the bay.

Shepard cranes and hoists are installed to meet the peculiar needs of individual shops and factories. Shepard engineers offer their services in designing the equipment which will most efficiently and economically handle your material.

Electric Cranes 1 to 50 tons; Electric Hoists ½ to 30 tons; Electric Winches and Cargo Handling Equipment for Docks and Ships.

The Shepard is thoroughly lubricated; and tight metal housings encase the operative mechanisms, eliminating dirt, dust, dampness, and fumes.

Shepard Electric Crane & Hoist Co.
426 Schuyler Ave., Montour Falls, N.Y.

New York Philadelphia Chicago Pittsburgh
Boston Baltimore Cleveland San Francisco
Detroit Melbourne Montreal London

Canadian Representative: RUDEL-BELNAP, Montreal

Member Electric Hoist Manufacturers' Assn. 2159-S

A File Has Limits

A file can't do good work after it has lost its original sharpness.

Remember this and throw a file away as soon as it shows signs of getting dull.

It will repay you in the end.

The following brands do not get dull until they have given you full value for your money. Specify one of them when ordering:

Kearney & Foot
Great Western
American
Arcade
Globe

FILES

Made in Canada by

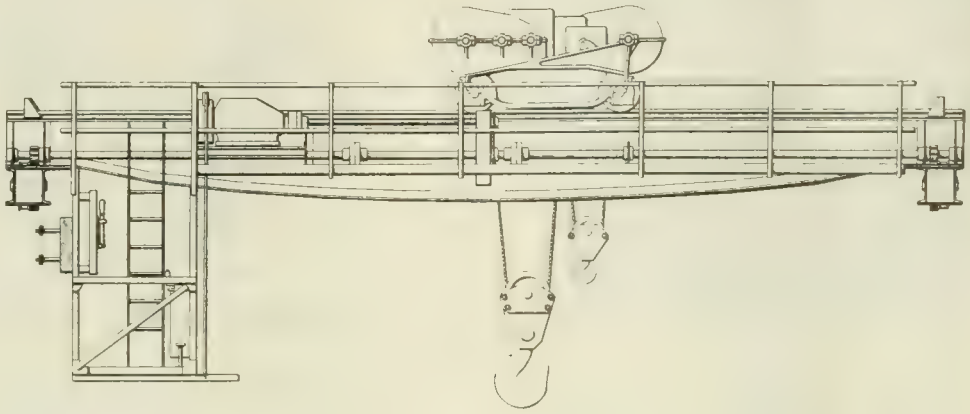
Nicholson File Company

Port Hope - Ontario

If interested tear out this page and place with letters to be answered.

CRANES

ELECTRIC AND HAND OPERATED



DOMINION BRIDGE COMPANY LIMITED

HEAD OFFICE & WORKS: MONTREAL BRANCHES:-OTTAWA, TORONTO, WINNIPEG

HYDRAULIC TURBINES AND PUMPS

Our shops are equipped for building TURBINES of the largest sizes —also high speed PUMPS of large capacity for medium and low heads. Two turbines of 20,000 H.P. are now under construction.

PAPER MILL MACHINERY

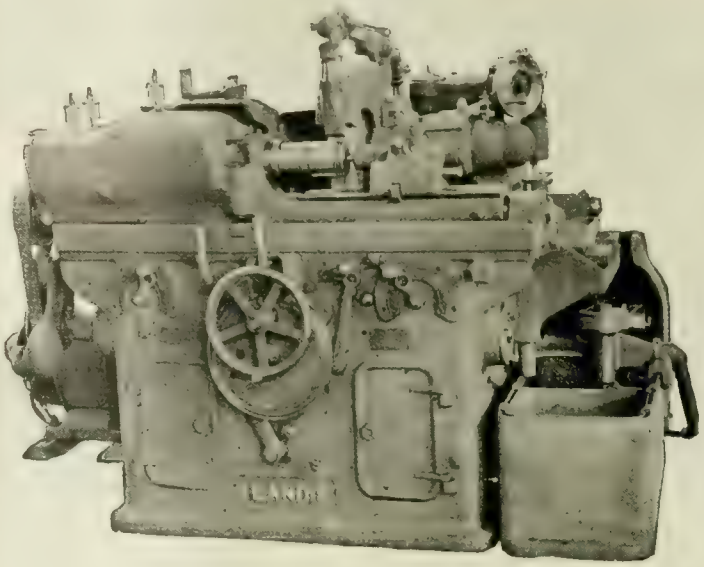
Pulp Drying Machines.
Millspaugh Suction Rolls.
Millspaugh Shower Pipes.
Davies Oscillating Suction Boxes.
Press and Felt Rolls.
Brass Covered Rolls.
Pulp Digestors.
Barking Drums.
P.A.P.A. Screens (Spangenburg System) for pulp and paper.

DOMINION ENGINEERING WORKS, LIMITED

MONTREAL - QUE.

LANDIS

100 Per Cent. Production



THE New Landis Piston Grinding Machine meets both essentials 100 per cent. strong.

A brief summary of the principal features and what they accomplish in better pistons and greater production:

Cylinder part and relief, ground complete without removing from the machine, insuring concentricity of all grinding operations. Work practically remains in plane with grinding wheel centre at all times as the work swings directly over the fulcrum point. A number of different sized or shaped cams can be placed in attachment at the same time, thus enabling different shaped pistons to be ground with slight adjustment.

Universal driver furnished with each attachment, facilitating round and accurate work.

Write to-day for complete description.

Landis Tool Company, Waynesboro, Pa.

Canadian Agents: A. R. Williams Mach'y Co., Toronto, Winnipeg, Vancouver; Williams and Wilson, Montreal

Open a Bank Account in Canada

The present abnormal exchange situation between Canada and the United States is affecting trade relations between the two countries. Exporters in the United States can meet this by opening Bank Accounts in Canada.

This Bank has 725 Branches, of which 625 are located in Canada from the Atlantic to the Pacific Coast. Write for a complete list of Branches and for terms respecting a Canadian account.

THE ROYAL BANK OF CANADA

Capital and Reserves $40,000,000 **Total Resources $550,000,000**

Head Office: MONTREAL

If interested tear out this page and place with letters to be answered.

Automotive Industry Watching Costs

IT TOOK a price reduction to "sell" automotive manufacturers on the idea (which they all know in the backs of their heads) that when you can't make a profit by increasing or maintaining prices—you can still make a profit on reduced prices, by

1. **Watching costs.**
2. **Increasing production (which is the same as lowering overhead per unit).**

What a crisis showed one group of manufacturers, can be adopted to the advantage of other manufacturers (without the crisis, perhaps) if they will profit by the experience.

GTD has maintained and proved by many experiences that in the work of screw-threading, GTD tools, particularly *"Gun"* Taps, *"Acorn"* Dies and GTD Gages, reduce costs and increase production.

We will gladly supply you with details regarding these GTD tools. Just clip the coupon and send it in. No obligation, of course.

This is the *"Gun"* Tap

Its features are a shearing cut — no chips to clog flutes and break tap — shallow flutes giving great strength —requires one-half power necessary to drive ordinary tap — cuts true to size until ground down to last three or four teeth. The *"Gun"* Tap will outlast two or three ordinary taps, and *wears out before it breaks.*

This is the *"Acorn"* Die

It has a positive, concentric adjustment on all cutting lands, making it practically a solid die, and insuring great accuracy. By means of its various holders, it is adapted to all kinds of machines using threading dies, lathes, drill presses, hand or automatic screw machines, turret lathes, bolt cutters, etc. Its life is many times that of the ordinary die.

GTD *Gages*

There is only one standard inch. The U.S. Government sets that standard GTD gages accurately reproduce it. A certificate of the Bureau of Standards will be furnished with any of our gages, when requested. GTD manufactures both thread and cylindrical gages and designs complete gaging equipment for any product. GTD gages increase production and lower costs. Our gage experts are always at your service.

GREENFIELD TAP AND DIE CORPORATION
OF CANADA, LIMITED GALT, ONTARIO

Successors to Wells Bros. Co. of Canada, Ltd., Galt, Ontario.

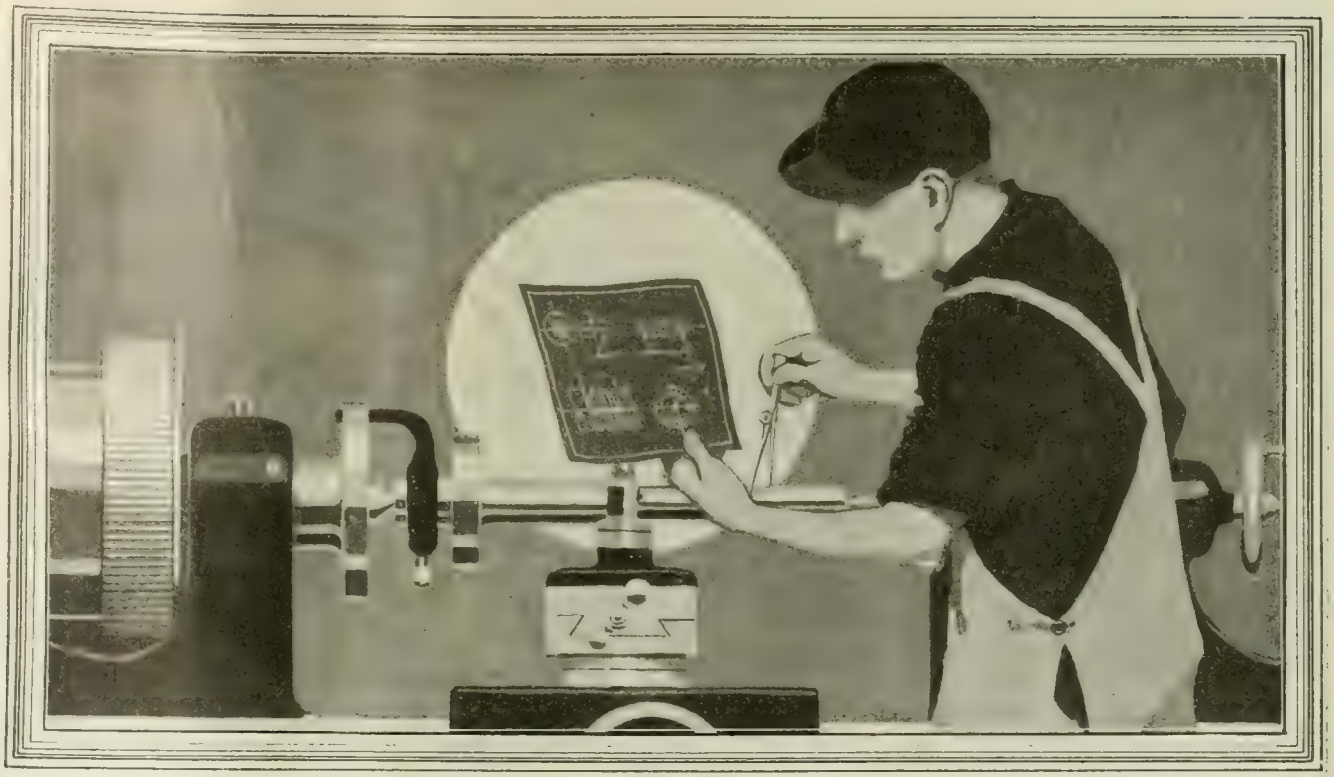
GTD Screw Plates, Taps, Dies, Twist Drills, Milling Cutters, Reamers, Gages, Pipe Wrenches

GTD Corporation of Canada, Ltd., Galt, Ont.

I am interested in increasing production and lowering costs. Without obligation please send me complete information regarding the GTD tools I have checked.
[ ] "Gun" Tap. [ ] "Acorn" Die.
[ ] GTD Gages

Name .....
Position .....
Firm .....
Address C.M.203

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.



His Work Guide is a PHOTOSTAT Print

(REG. U.S. PAT. OFF.)

Speed Up Your Production Too

The whole world sorely needs every helpful effort.

This machinist is working from a Photostat print made direct from a pencil sketch.

Hours and often days are thus saved in putting work into and through the shop.

In the office, too, the Photostat is invaluable because it makes facsimile copies of blue prints, maps, charts, progress sheets, sales sheets, advertising layouts, etc.

Send for our booklet in which some of our customers tell in their own way how the Photostat is used both for standard and special work.

The Photostat is made by the Eastman Kodak Co., exclusively for the

Photostat Corporation, Rochester, N.Y.

Boston Chicago New York City Philadelphia San Francisco Washington

EXECUTIVE OFFICE: PROVIDENCE, R. I.

PHOTOSTAT

If interested tear out this page and place with letters to be answered.

WE HAVE TESTED THEM FOR YOU

PNEUMATIC MOTOR HOIST

In sizes for lifting 1,000 to 6,000 lbs.

Thor

PNEUMATIC and ELECTRIC TOOLS

When you put THOR Tools on your work you are not "trying them out." Every minute mechanism in THORS is tried, tested, improved and perfected before it comes to you. All left for you is to decide, with the assistance of our expert mechanical department, the tool best adapted to your particular work. Hundreds of plants, knowing the reliability and tested merit of THORS, have adopted them as standard equipment.

Send for detailed information or Service Engineer to call.

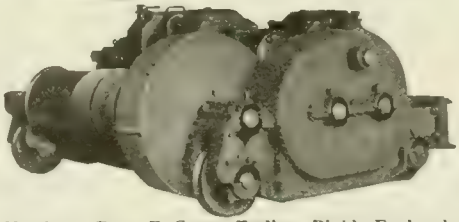
INDEPENDENT PNEUMATIC TOOL CO.

MONTREAL TORONTO 600 W. Jackson Blvd., Chicago VANCOUVER WINNIPEG

CANADIAN MADE CANADIAN MADE

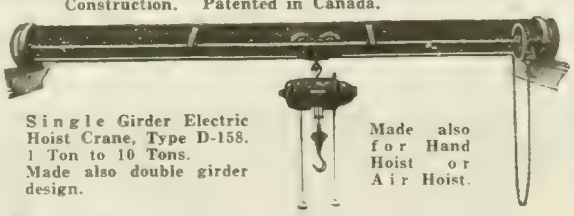
Electric and Hand Traveling Cranes

Type E—3-Motor Electric Traveling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons. Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

Type D Electric Hoists—½ to 10 Tons.

Air Hoists, Trolleys and Tracks

Type No. 20 Air Hoists.

Northern Crane Works, Limited

Walkerville, Ontario, Canada

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Heavy Duty

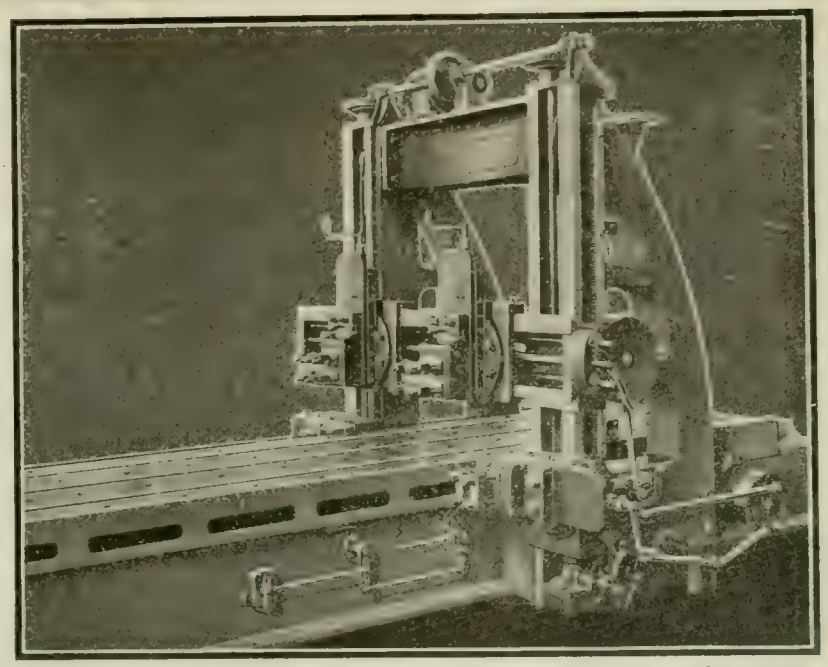
PLANERS

48" x 48" x 14' 0"

No shop should make **production boasts** without an L. & P. Heavy Duty Planer on the job. The latest improved design embodies great accuracy.

Either Two-Post or Openside Type

All power feed. Belt or direct connected motor drive.



L & P MANUFACTURING CO.
LIMITED
NIAGARA FALLS, ONTARIO

L. & P. Heavy Duty Planers are sturdy, finely finished machine tools. If you are interested in well-built tools investigate these Planers. We are prepared to ship direct from stock.

THE TUBE COMPANY OF CANADA LIMITED

Electric and Oxy-Acetylene

WELDED TUBING

Also BUTT SEAM TUBING

We have a thoroughly equipped plant for Welding by Electric and Oxy-Acetylene processes. Butt Seam Tubing is also one of our specialties. Tubing made hot or cold rolled finish.

Our Work Includes Tubing for

Bicycles, Bedsteads, Automobile Parts, Electric Fixtures, Gas Fixtures, etc. Round, Square, Rectangular and Special Shapes. Sizes ⅜ in. to 2 in. outside diameter, from 16 to 22 gauge. Also equipped for bending 16 gauge or lighter, any shape or radius.

Let us advise you of the kind of tubing that will best suit your requirements. Inquiries gladly answered.

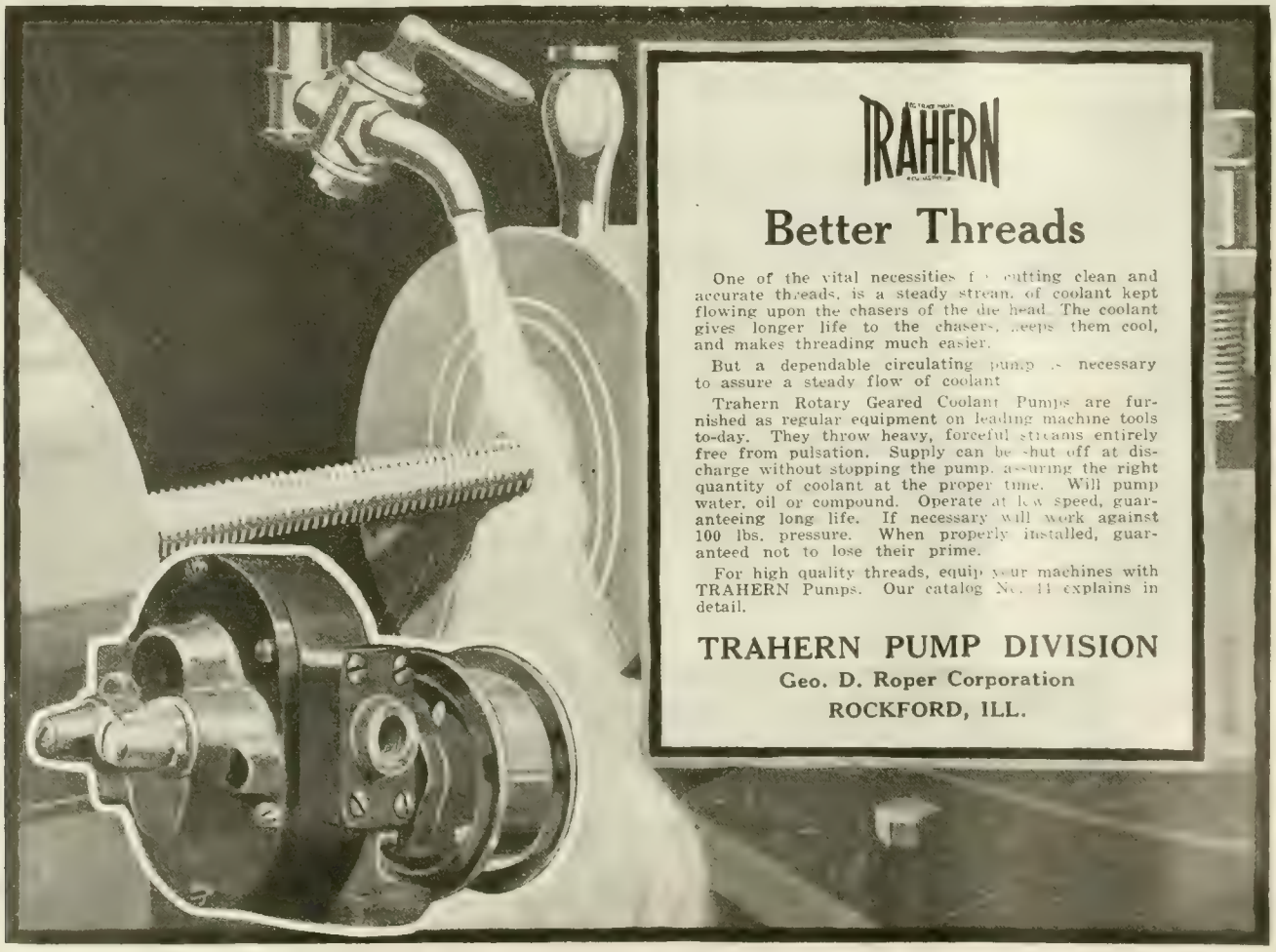
The Tube Company of Canada LIMITED

233 Dufferin Street, TORONTO, Canada

W. ATKINS & CO LD Sheffield ENG

The
HIGH SPEED STEELS
For superior cutting power:
"Double Waco" and "Waco Superior"
Carbon Tool Steels
For all Purposes.
"Turtle Brand," unequalled for reliability.
MINERS' DRILL STEELS
Solid and Hollow.
All Sections.

Representative
MARSHALL SON & BUNNEY
39 Richmond St East
TORONTO



TRAHERN

Better Threads

One of the vital necessities for cutting clean and accurate threads, is a steady stream of coolant kept flowing upon the chasers of the die head. The coolant gives longer life to the chasers, keeps them cool, and makes threading much easier.

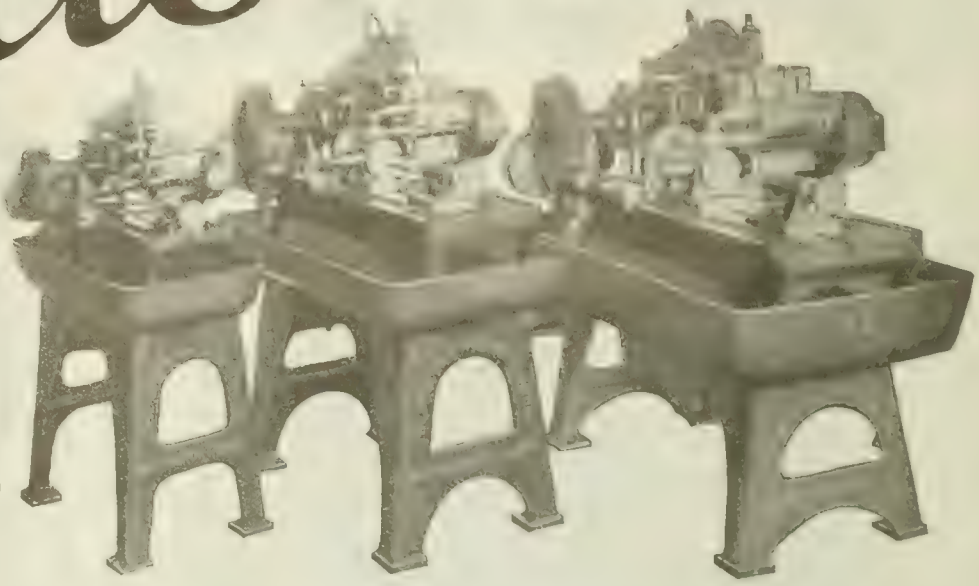
But a dependable circulating pump is necessary to assure a steady flow of coolant

Trahern Rotary Geared Coolant Pumps are furnished as regular equipment on leading machine tools to-day. They throw heavy, forceful streams entirely free from pulsation. Supply can be shut off at discharge without stopping the pump, assuring the right quantity of coolant at the proper time. Will pump water, oil or compound. Operate at low speed, guaranteeing long life. If necessary will work against 100 lbs. pressure. When properly installed, guaranteed not to lose their prime.

For high quality threads, equip your machines with TRAHERN Pumps. Our catalog No. 11 explains in detail.

TRAHERN PUMP DIVISION
Geo. D. Roper Corporation
ROCKFORD, ILL.

Bilton GEAR MILLERS



Fully Automatic

Their adaptability is almost unlimited on small work—such as cutting spur, bevel, miter, angle gears, saws, ratchets, sprockets, cutters, knurls, taps, cylinders, form cutting, manufacturing, milling, etc.

A big time saver, as indexing takes place during return stroke of cutter — which is removing metal 90% of the time.

Write us for Catalog **30-6**

Over 500 leading manufacturers now use the Bilton for high production on accurate work

Bilton Machine Tool Co. Housatonic Avenue **Bridgeport, Conn., U.S.A.**

Foreign Agents: Alfred Herbert, Ltd. Chas. Churchill & Co., Ltd.

DOMINION GRINDING WHEELS

The Same Quality for Less Money

We know you have no use for wheels which will not stand up and do high-class work, even though they do cost you less to buy. You want **quality** at the lowest price. And that means **Dominion Wheels!**

Dominion Wheels are made of abrasives from our own factory, thus ensuring uniform grade and grain.

By purchasing Dominion Wheels you save duty and exchange. When the quality is right, is there any reason for sending your money out of the country?

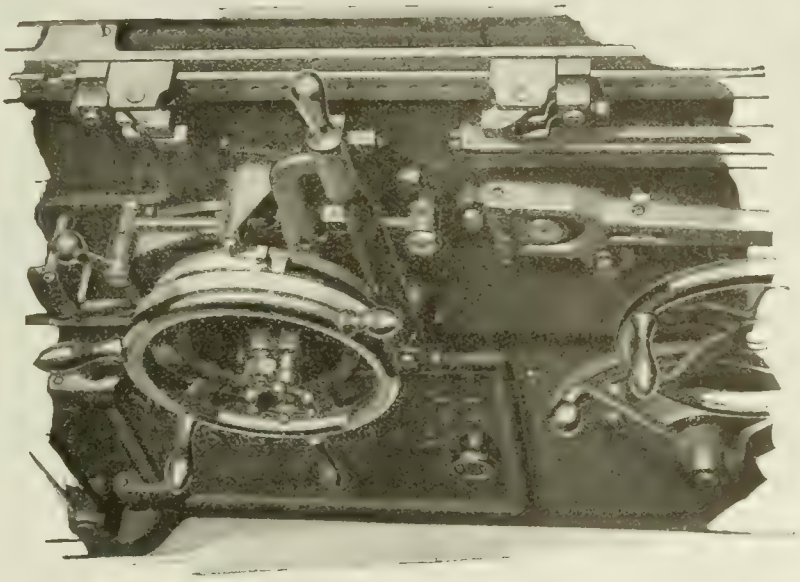
Dominion Abrasive Wheel Co. Ltd.

Mimico, Ontario

If [illegible] you can not [illegible] this page [illegible] write [illegible] to be answered.

MODERN

Plain Grinding Machines



ALL CONTROLS CENTERED ON FRONT

A "Modern" operator doesn't have to lean this way and that to control his machine. All controls are on front of machine within easy reach. This accomplishes three important things:

1st—Avoids needless fatigue.

2nd—Permits closer attention to work.

3rd—Reduces number of spoils.

Thus "Modern," with its centered controls benefits both operator and employer.

Let us send you our latest bulletin showing the other advantages of "Modern" construction. If you've a grinding problem "Modern" can likely solve it for you. Send your blueprints and specifications and our Service Department will get busy.

MODERN TOOL CO. - - ERIE, PA.

Main Office and Works: State and Peach Sts.

CANADIAN AGENTS:

RUDEL-BELNAP MACHINERY CO., LIMITED

Toronto and Montreal

Foreign Representatives: Yamatake Company, Tokyo, Japan; Leo. C. Steinle, 53 Victoria St., London, S. W., England; Glaenzer & Perreaud, 18 and 20 Faubourg du Temple, Paris, France; Rylander & Asplund, Stockholm, Sweden; C. Civita & Co., Milan, Italy; J. Lambercier & Co., Geneva and Zurich, Switzerland.

This Mark On Belting

Means the End of Your Belt Troubles

D.K.McLaren's

Genuine British Oak Tanned

Leather Belting

Shows what a farce is the idea that adequate pulley grip can only be secured by extraordinary tension. It stands to reason that such tension plays particular havoc with the belting—strains shaftings and wears out bearing.

D. K. McLaren's Leather Belting renders you the service you ought to demand! It is amply flexible and as nearly stretchless as leather belting should be.

Compare the "hug" of a slightly slack D. K. McLaren's Belt with the extraordinary tension required to make other belts grip. This test will convince you as it is daily convincing others.

Back Leathers—Every inch of D. K. McLaren Belts represents Flawless Backs of the hides of the choicest steers.

British-Oak-Tanned—Every bit of the hide's natural strength is preserved in D. K. McLaren's Belts by the expert use of this famous process.

D·K·McLAREN LIMITED

GENUINE OAK

HEAD OFFICE AND FACTORY:
351 ST. JAMES ST., MONTREAL, P.Q., CANADA

VANCOUVER, B.C. 334 Cordova West
TORONTO, ONT. 194 King St. West
ST. JOHN, N.B. 90 Germain St.

D. K. McLAREN, Limited,
Gentlemen.—Please put me in touch with some users of your belting.

Name .....
Address .....
Firm .....

If interested tear out this page and place with letters to be answered.

Gear Cutting With the "IFS" Left Out

The Gear Shaper Way

A production manufacturer knows that he will secure good gears IF he has an accurate cutter, an accurate machine and a machine working on the correct principle. The whole question of good gears is resolved in this one little word "IF."

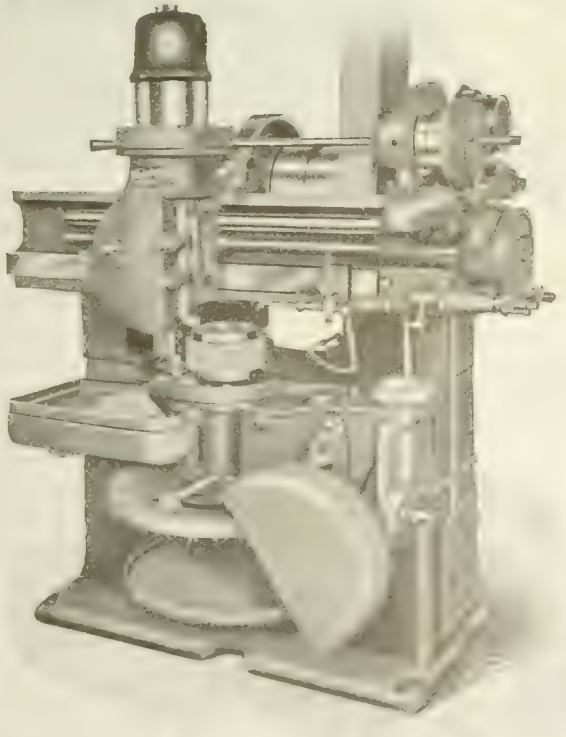
When the Gear Shaper was originally designed, the question of "IF" was taken into consideration and every possible means known to mechanical engineering was employed to eliminate the "IFS" from gear cutting.

That we have been successful in solving the problem is evidenced by the fact that each ensuing year sees a larger number of manufacturers adopting the Gear Shaper method.

How the Gear Shaper has accomplished this is clearly explained in our general catalog "Commercial Gear Cutting," which is a treatise on the subject of:—

Gear Cutting with the "IFS" Left Out.

Send for your copy to-day.

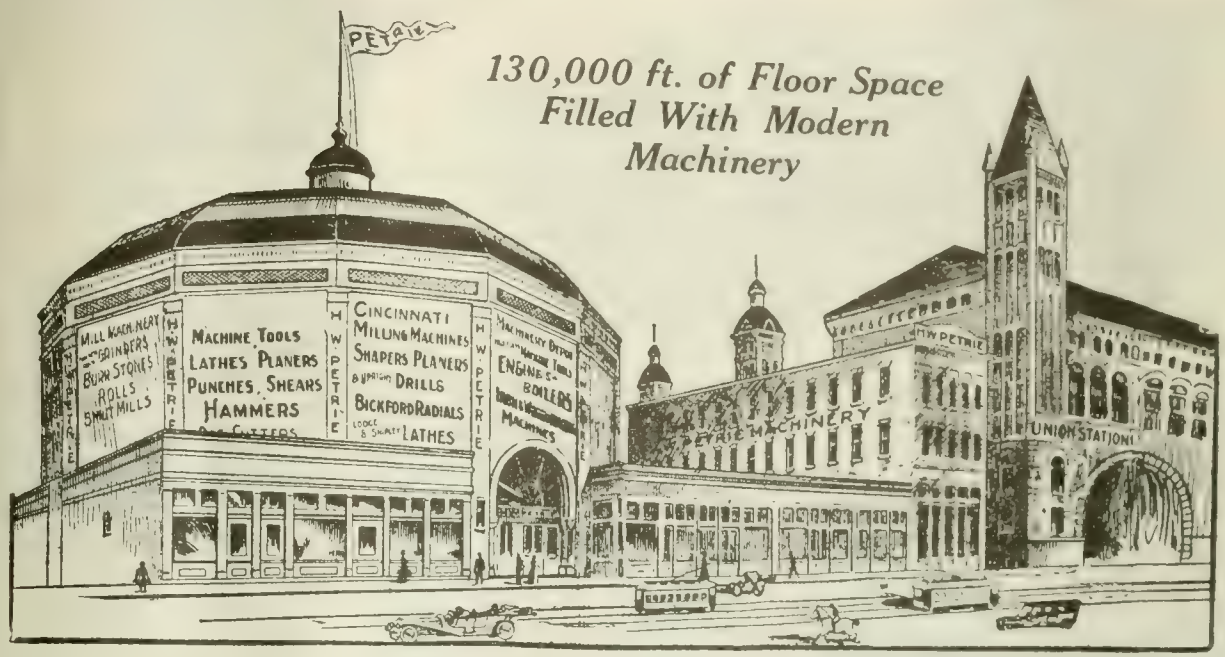


The Fellows Gear Shaper—the machine which has taken the "IFS" out of gear cutting

The Fellows Gear Shaper Company

Springfield, Vermont, U.S.A.

FOREIGN AGENTS:—Alfred Herbert, Limited, Coventry, England; Societe Anonyme Alfred Herbert Italiana Alfred Herbert, Milan, Italy; Alfred Herbert, Limited, Yokohama, Japan; Societe Anonyme Alfred Herbert Societe Anonyme Belge Alfred Herbert, Brussels, Belgium; Alfred Herbert (India), Limited, Calcutta, India



130,000 ft. of Floor Space Filled With Modern Machinery

PAY US A VISIT

WHEN IN TORONTO

If you would like to see the largest exhibit of machine tools in Canada, pay a visit to our warehouse the next time you are in Toronto. No trouble to find our place. It is situated next door to the Union Station. Here we have 60,000 feet of floor space devoted to metal-working and woodworking machinery of all kinds, in addition to supplies and power transmission machinery.

Then there is our annex at the corner of Niagara and Bathurst Streets—70,000 feet of floor space and 40 acres of yards here, filled with machinery that meets all demands of Canadian shops. Our warehouse space thus totals 130,000 square feet, accommodating an immense line of tools—modern tools that are worthy of the attention of all careful buyers.

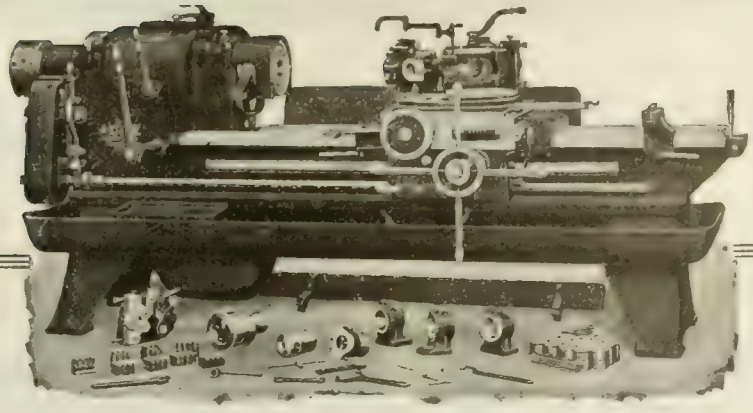
This invitation of course applies to Torontonians, too. Call on us at any time. You are always welcome.

H. W. PETRIE, LIMITED

TORONTO and HAMILTON

PETRIE

If interested [illegible] answered.



CINCINNATI ACME

Convenience

Don't overlook this feature in considering the points of a machine tool; it's a factor of vital importance in securing volume production.

Look at this turret lathe for convenience! On it and all other Cincinnati Acmes, the levers and handles are directly in front of the operator.

The Cincinnati Acme stands for strength and precision as well as convenience. It is a sturdy, rigid machine, built for **accurate** speed. And it will do both bar and chuck work.

The Cincinnati Acme line of machine tools includes Flat Turret Lathes, Screw Machines, Turret Lathes, Brass Working Machines, Universal Turret Lathes, and all accessories. Every machine is designed on the most modern principles. Write for catalog.

The Acme Machine Tool Company

Cincinnati, Ohio, U.S.A.

Conservation of Oil

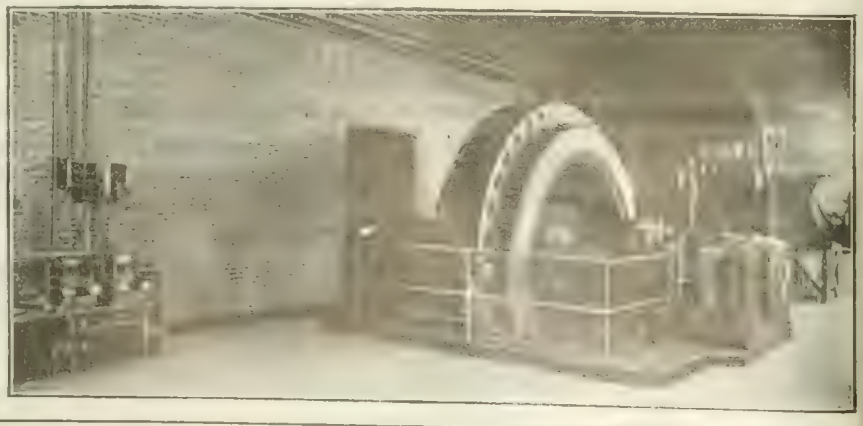
The consumption of mineral oil products is increasing faster than the production. Consequently engineers are beginning to realize how important and necessary it is to conserve these oils.

A Bowser Oil Filtration System will assist you in doing this.

By filtering oil with a Bowser system it can be used over and over again — or indefinitely. The installation of a Bowser Complete Oil Filtering and Calculating System generally results in a saving of over 50 per cent. on your oil bill.

The picture on the right shows a practical application of a Bowser 6-F Oil Filtering and Circulating System. It can be used with engines and other machinery where the filtration of dirty oil is essential.

[illegible] for our booklet on oil filtration.



S. F. Bowser Co., Ltd.

66 Fraser Ave.

Toronto, Canada

STEEL *for*
Every Commercial Purpose

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the waste of ingot.

We can supply forgings of all shapes and sizes made of ordinary or "HARMET" Fluid Compressed Open-Hearth Steel on the Shortest Notice.

Nova Scotia Steel and Coal Co., Limited

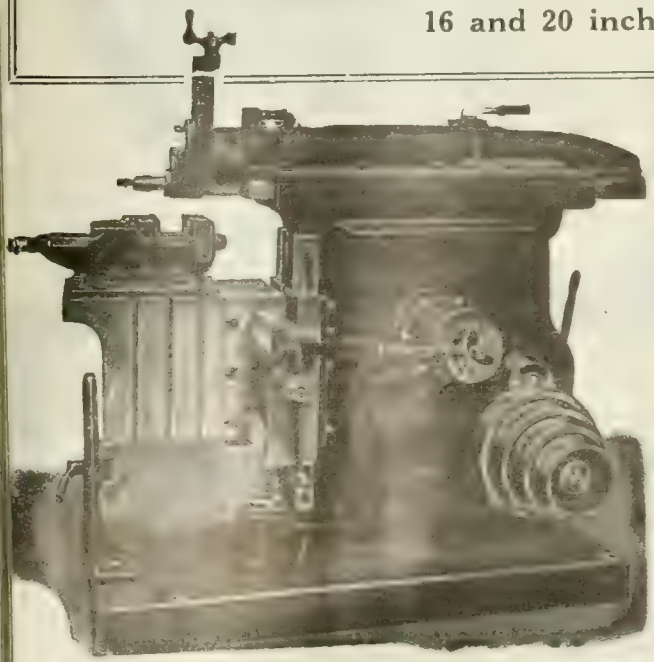
Head Offices:
New Glasgow, N.S.

Sales Offices:
Western Room 14 Windsor Hotel
MONTREAL

Steel Ingots
by the
HARMET
Liquid Process

McDougall Crank Shapers
16 and 20 inch

ARE-MAC-DEE IS A GUARANTEE



A Bigger Day's Work—

is made possible with McDougall Crank Shapers than with any ordinary Shaper because the McDougall is built on lines especially for this purpose. It embodies the most approved features of the most practical shapers on the market and care has been taken to exclude all non-essential parts.

The column is massive in construction, well braced and reinforced internally. Exceptional strength is also seen in the ram, which is semi-circular in form and of box type. It can be set forward by crank conveniently arranged.

Slides are square, accurately fitted and with broad bearing surfaces.

Have us explain the other salient points of this finely constructed machine. Full details on request.

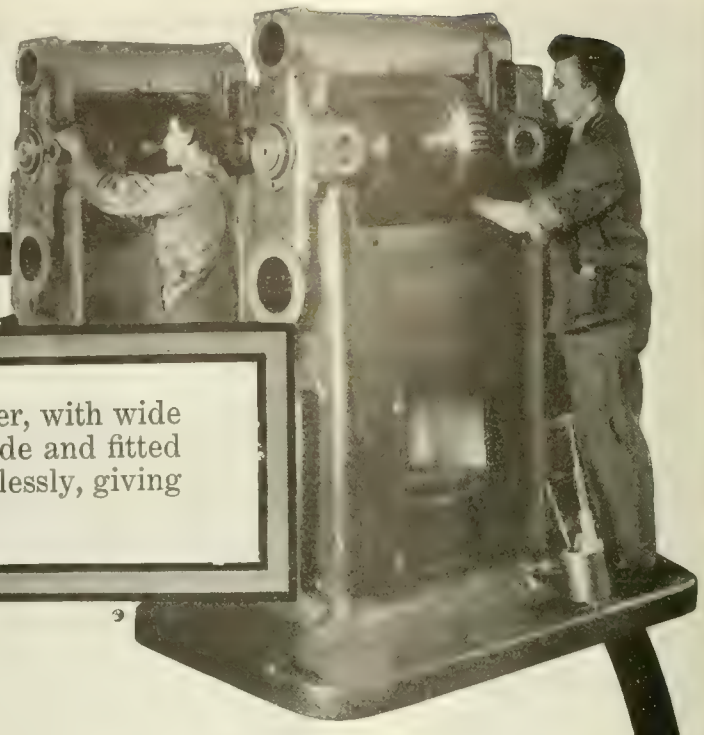
THE R. McDOUGALL COMPANY, LIMITED, Galt, Ont., Can.

The Canadian Fairbanks-Morse Company, Limited
Sales Agents

BROWN & SHARPE

HEAVY SERVICE

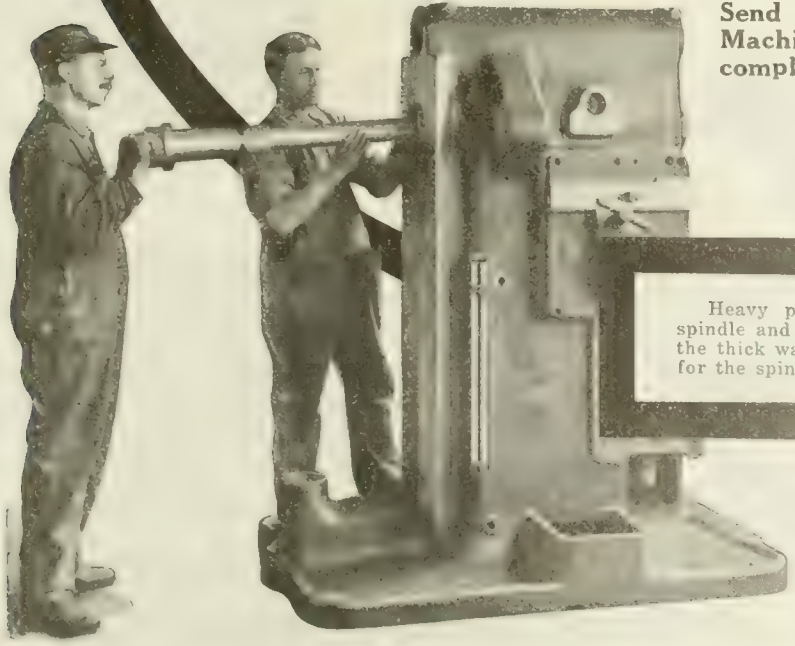
MILLING MACHINES



The back gears are of large diameter, with wide face and coarse pitch, carefully made and fitted so that they run smoothly and noiselessly, giving a positive, steady drive.

MANUFACTURERS desiring powerful machines capable of removing quantities of stock at fast speeds and coarse feeds will find our heavy service machines well suited to their work.

Send for our Milling Machine Book, giving complete details.



Heavy phosphor bronze boxes, scraped to fit the spindle and accurately aligned, are mounted directly in the thick walls of the column, providing a firm support for the spindle.

BROWN & SHARPE MFG. CO.

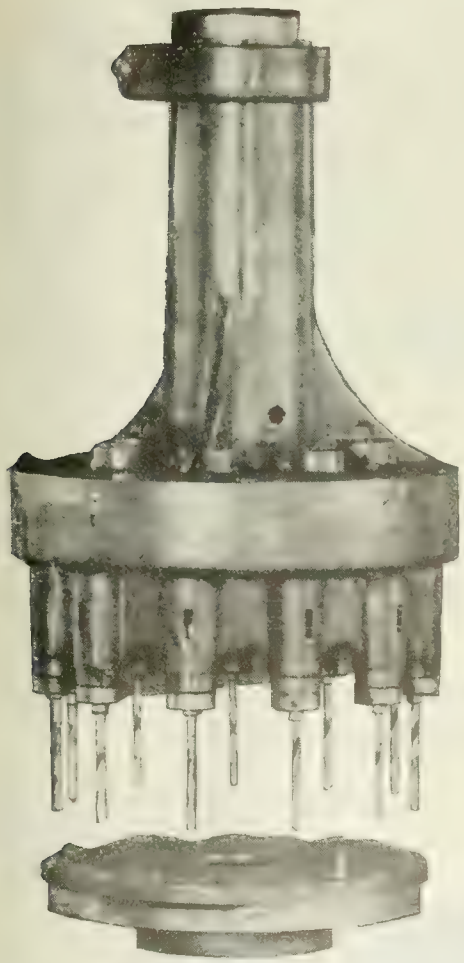
PROVIDENCE, R.I., U.S.A.

CANADIAN REPRESENTATIVE:
CANADIAN FAIRBANKS-MORSE CO., LTD.

If what you need is not advertised, consult our Buyers' Directory and write us for proper heading.

HOEFER

Multiple-Spindle Auxiliary Heads mean multiplied driller output



Four hundred manufacturers in more than a hundred different lines report that these heads have paid for themselves in from thirty to sixty days.

Hoefer Auxiliary Heads are furnished with any number of spindles required, in any arrangement, for heavy duty as well as for work requiring the greatest precision.

One of these Heads applied to the drillers you are now using, regardless of make, will not only enable you to drill many holes for the present cost of one but also will save the time now lost in shifting jigs and raising and lowering the spindle.

Send blueprint or sketch showing number of holes to be drilled, sizes, and center distances.

26

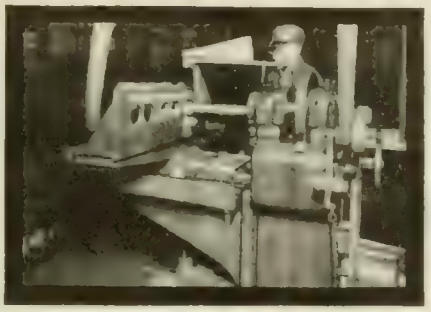
Send for the Hoefer Catalog

HOEFER MFG. CO., FREEPORT, ILL.

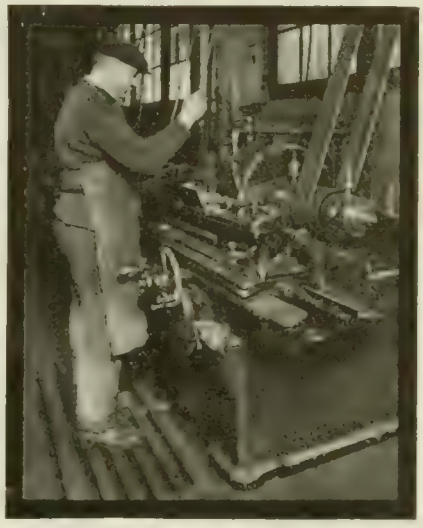
Sales Engineers for Hoefer Heads: Chi... **New York,** ... Church St., Philadelphia, ... Buf... cott Square Bldg., **Cleveland,** ... Bldg.; **Detroit,** 602 Kerr B... Milwaukee, ... **apolis,** A. D. Heath Mach... Minneapolis; **Louis,** Colonial-Wright Mach... & ... Satterlee ... Montreal, C...

Sales Offices for Hoefer Driller... Boston, ... **Providence,** Brownell Machinery Co., New York, ... Woolworth Bldg.; **Philadelphia,** Fairbanks-Morse Co., 917 Arch St.; **Baltimore,** Aumen Machinery Co., 107 E. Lombard St.; **Syracuse,** C. H. ... Rochester and Buffalo, Ogden R. Adam... Pittsburgh, Motch & Merryweather Machinery Co.; **Cleveland,** Cleveland Tool & Supply Co.; **Indianapolis,** E. A. Kinsey Co.; **Detroit,** Cadillac Tool Co.; **Chicago,** Federal Machinery Sales Co., 12 N. Jefferson St., Milwaukee, Badger-Packard Machinery Co.; **Minneapolis,** F. E. Sat... St. Louis, ... & Supply Co.; ... Tampa, Jacksonville and Charleston, Cameron & Barkley; **Spartanburg,** Montgomery & Crawford; **Mobile,** Turner ... Birmingham, ... & Vale Co., New Orleans, Oliver H. Van Horn Co.; **Houston,** Peden Iron & Steel Co.; **Seattle, Portland,** San Francisco, Los Angeles, ... & Smith Co., **Montreal,** Canadian Fairbanks-Morse Company (head office), for all Canada.

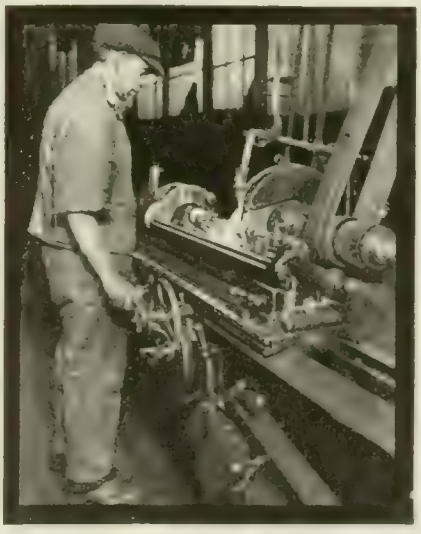
If interested tear out this page and ... letters to be answered.



Grinding Cylinder Castings, Heald Machines. Wheels are Norton Crystolon, 24-J, 3½ in. x ¾ in. x 1¼ in. Limits are plus or minus .001 in.; stock removed .008 in. to .012 in.



Roughing Camshafts, Norton Machine; Norton Alundum Wheel, 24-Q 18 in. x 1¾ in. x 5 in. Camshafts are rough ground with Norton Alundum Wheels, 24-Q 18 in. x 1¾ in. x 5 in. and finish ground with a Norton Alundum 24-I. 18 in. x 1¾ in. x 5 in. wheel



Finish Grinding Camshafts, Norton Machine, Norton Alundum Wheel, 24 Combination L, 18 in. x 1¾ in. x 5 in.

The Grinding Wheel *and* The Gasoline Engine

For photographs and details we are indebted to the Buda Company, *Harvey, Illinois*

It is remarkable that there are few parts of gasoline engines which are not ground—cylinders, pistons, connecting rod bushings, valve heads, push rods, crankshaft bearings, pins, camshafts, and many other parts depend largely on the grinding wheel industry for efficient production and accuracy.

CYLINDER GRINDING—The proper grinding of the cylinder—which is the fundamental of the engine—determines the efficiency of the assembled machine. In the cuts shown, cylinders, cast four en bloc, are ground on Heald Cylinder Grinders, using Crystolon wheels 24-J —3½ in. x ¾ in. x 1¼ in. As the cylinders come from the Boring department, there is about .010 in. stock left on diameter for grinding, which is within .001 in. limits. Each machine completes twelve castings in an eight-hour day, a total of 48 cylinders.

GRINDING CAMSHAFTS—In grinding the seven different types of cams, three Norton machines equipped with Alundum No. 24-Q, 18 in. x 1¾ in. x 5 in. wheels are used for roughing, and three machines with 24 combination K, 18 in. x 1¾ in. x 5 in. wheels for finishing.

CONNECTING ROD BUSHINGS—Obtaining a perfect surface on the bronze connecting rod bushings, and bringing them down to size direct from the rough, is now done by grinding alone. This removes about 3-16 in. of stock, and production is 600 in eight hours, using Norton 24 Combination M, 20 in. x 4 in. x 12½ in. wheels.

Norton Company of Canada, Limited
HAMILTON, ONTARIO

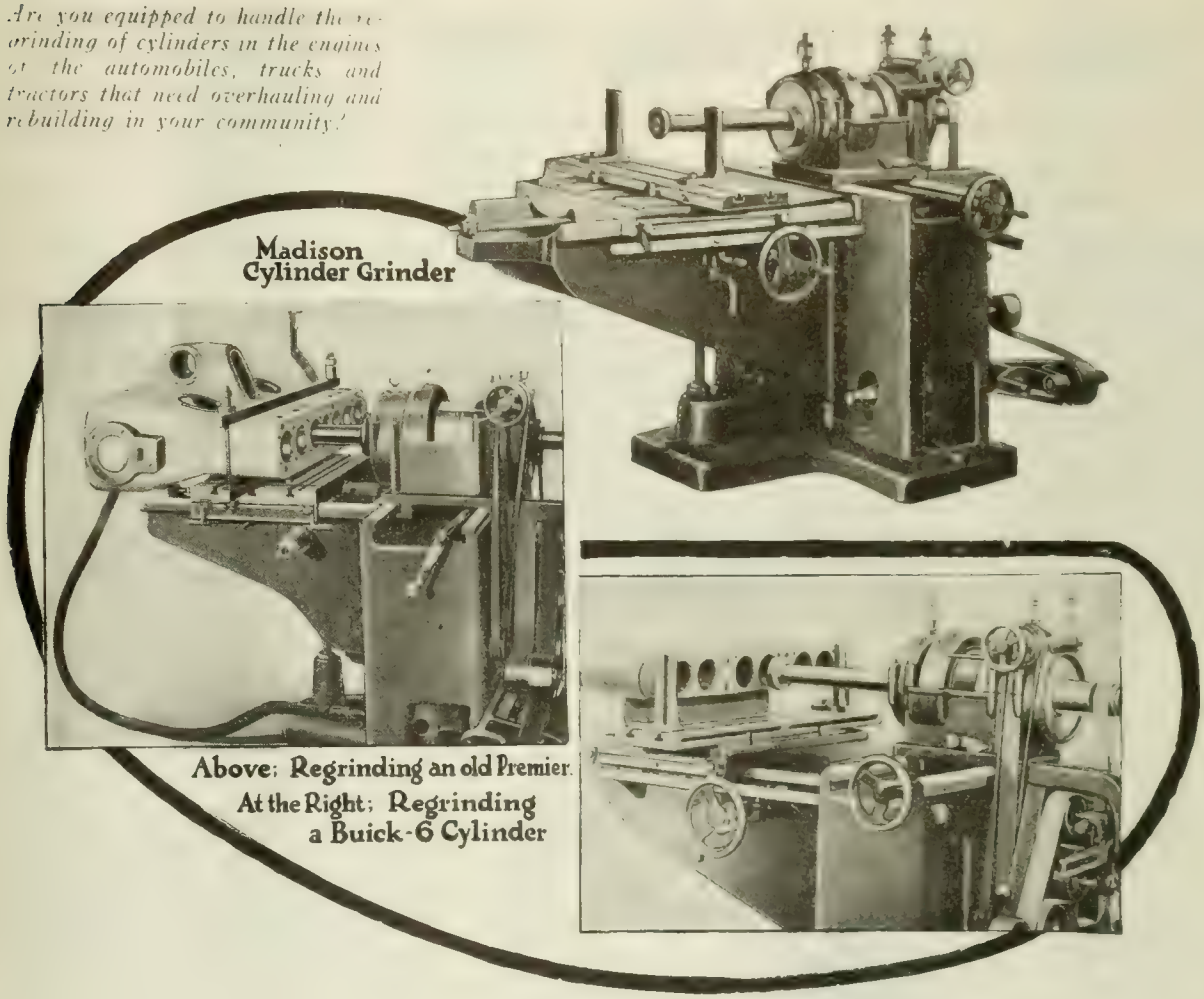
Electric Furnace Plants:
Niagara Falls, N.Y.
Chippawa, Ontario, Canada

Canadian Agents:
The Canadian Fairbanks-Morse Co., Ltd., Montreal Toronto, Ottawa, St. John, N.B., Winnipeg, Calgary Saskatoon, Vancouver, Victoria.
F. H. Andrews & Son, Quebec, Que.
Simonds Canada Saw Co., Vancouver, B.C.

Grinding Connecting Rod Bushings, Norton Wheel 24 Combination M, 20 in. x 4 in. x 12½ in. Bushings are Ground [illegible] size from the rough.

Re-grinding Cylinders at a Profit

Are you equipped to handle the re-grinding of cylinders in the engines of the automobiles, trucks and tractors that need overhauling and rebuilding in your community?



Above: Regrinding an old Premier.
At the Right: Regrinding a Buick-6 Cylinder

Add the profit of cylinder grinding to your automobile repairing and not only increase your profits considerably but make your customers boosters for you by putting power and life into their cars.

Put a Madison Cylinder Grinding Machine to work for you and do the gas engine cylinder re-grinding for all the repair shops in your vicinity.

Ask for the circular describing this machine—it will be sent you by return mail.

MADISON MACHINE TOOL COMPANY

1245 East Washington Avenue, Madison, Wisconsin, U. S. A

Please call letters to be inserted.

A Dick Belt lasts for years without giving any trouble

If it isn't here — write us.

- Dick's Balata Belting
- Graton & Knight Leather Belting
- Belt Lacers
- Tools
- U.G. Hangers & Pillow Blocks
- Hyatt Roller Bearings
- Fairbanks Wood Split Pulleys
- Oneida Steel Split Pulleys
- Rockwood Paper Pulleys
- Turbo-gears
- S.K.F. Ball Bearings
- Rope Transmission
- Transmission Chain
- Elevators and Conveyors

The special nature of the gum used in Dick's Balata Belting makes it less susceptible to climatic conditions. Because of its uniform quality of manufacture, it has been installed with absolute confidence for many years.

Dick's Balata Belting

stretches less than other belting. It has superior tensile strength and flexibility, and it is so prehensile that power wastage due to slipping on the pulley is impossible if reasonable care is exercised. The durability of Dick's Balata Belting effects big savings in avoiding stoppages and breakdowns.

Our nearest branch house will send you any information you require, and is prepared to offer unusually capable technical advice.

The Canadian Fairbanks-Morse Co., Limited

Canada's Departmental House for Mechanical Goods

Halifax	Toronto	Fort William	Calgary
St. John	Hamilton	Winnipeg	Edmonton
Quebec	St. Catharines	Regina	Vancouver
Montreal	Windsor	Saskatoon	Victoria
Ottawa			

CANADIAN MACHINERY
AND
MANUFACTURING NEWS

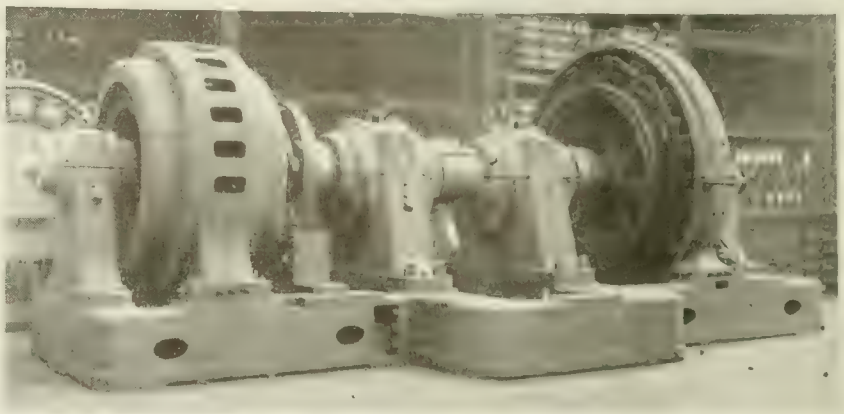
VOL. XXV. No. 9

March 3, 1921

New Universal Plate Mill

Technical Details — Construction Work—Electrical Equipment, and Various Other Features.

By J. H. Moore



THE FLYWHEEL MOTOR GENERATOR SET WITHOUT THE FLYWHEEL

THE universal plate mill just installed at the plant of the Dominion Foundries & Steel, Ltd., Hamilton, Ontario, will give Canada a mill of sufficient size to produce large plates, that heretofore have been imported through necessity. This mill, as already stated, is of the universal type and will roll universal plate from 7 inches to 41 inches, shear plate to 64 inches, and will roll both slabs and billets. At the present time all kinds of structural plates for bridges, buildings, cars, heavy pipe skelp, sheet bars, etc., are imported. These imports amount to hundreds of thousands of tons annually but the addition of this mill should help such work in our own country.

It is also intended to roll slabs and forging billets to furnish stocks for their own plow and jobbing mill, also their axle forge shop. These two departments have already been in operation for over two years. The new mill will also roll special forging billets or blooms, such as are used for locomotive, ship, and other heavy forgings. By removing the side rolls of the mill, sheared plates up to 64 inches can be rolled. It can also be equipped with blooming rolls for rolling billets, and a manipulator is installed to take care of this when used as a blooming mill.

At the close of the war this company found itself with a steel making capacity of over 12,000 tons per month; a large modern foundry; a heavy forge shop; a 22-inch bar mill; an axle shop, and a 26-inch jobbing mill. This latter mill was turning out soft center and solid plow steel, automobile frame steel, and jobbing plates, and it was realized that additional finishing capacity was absolutely necessary, not to speak of the need of equipment for the breaking down of the ingots for the existing finishing departments. After careful consideration, it was decided to install the plate mill about to be described.

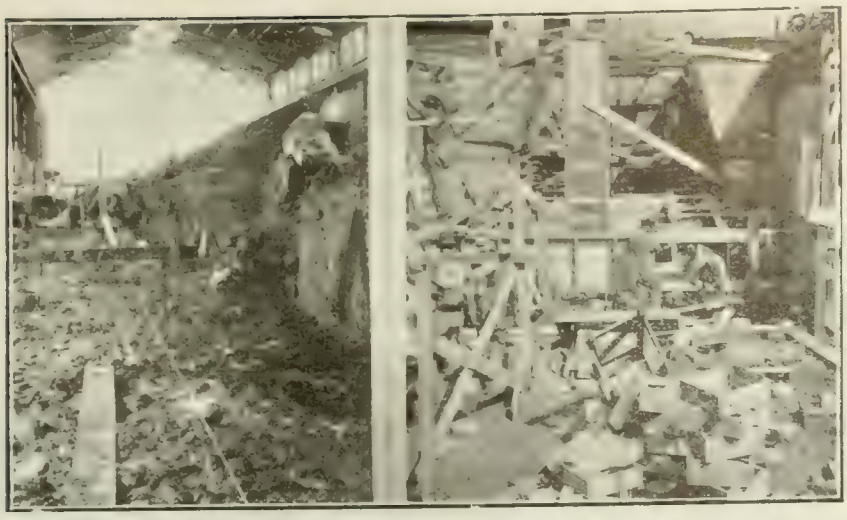
The mill itself is made by the Mackintosh & Hemphill Co., Pittsburgh, and is technically known as a 27-inch universal plate mill. The horizontal chilled iron rolls are 72 inches in length, with an extreme vertical lift of 20 inches. The vertical rolls both front and back are 18 inches in diameter, and have an opening range from 7 inches to 41 inches. The rolls are operated by hydraulic pull-backs, and the screw downs on the rolls are electrically operated. The main screw downs have two 60 h.p. compound wound motors in series, while for each set of side screws, there is a 40 h.p. motor of similar type.

The housings are cast steel of very rugged proportions, and many other principal parts on the mill are made from the same material. The pinions for both the horizontal and vertical roll drives are enclosed in oil type housings, and all these pinions have machine cut, helical teeth. The main screw down motors are mounted on the pinion housing cap, while the side screw motors are located in a pit at the side of the mill.

Provision is made for removing the side roll housings and inserting a short section of driven rolls both front and back, this allowing the rolling of shear plate up to 64 inches. This system of removing the side housings is also necessary when using as a blooming mill. The illustrations shown throughout the article are taken from various positions, and the details can be noted from the underlines.

Construction Work

It is of course easily understood that an installation of this size entails considerable preliminary construction work. Without even attempting to enter the details of the work involved, let us skim over for a moment a few figures that will show conclusively the magnitude of the task. The main building in which this mill is located is approximately 500 feet long by 68 feet wide. The tables for the mill run the complete length of the building, and reinforced concrete foundations for all these tables, shear, etc., had to be laid. Then there were the foundations for the different power plant units. All this meant considerable work, for it was absolutely necessary to trench down until good solid ground was reached. The inserted panel tells its only story in this respect. The construction views depicted illustrate a little of the work entailed, but we are making no attempt to touch this work in detail. Enough to say that the foundations are laid 14 feet down underneath the mill and of course tunnels are provided to allow workmen to attend to bolting down, repairs, etc. The amount of concrete used is surprising. Over 10,000 cubic yards of solid concrete has been laid and over 1,000 bolts have been used, these ranging from 1½ inches diameter up to 3 inches. A very notable



THE PICTURE TO THE LEFT SHOWS THE DIGGING OF TRENCH FOR TABLES. WHILE THE OTHER VIEW IS THE PREPARATORY WORK ON FOUNDATIONS FOR PORTION OF ELECTRICAL EQUIPMENT.

performance in continuous concrete pouring was brought to our attention, and the quantity poured is well worth repeating. In 2½ days 1,153 cubic yards were poured, this of course being for 24-hour days.

Electrical Equipment

The mill is direct connected to a 5,000 h.p. reversing motor of the compensating commutating pole type, and is specially designed to withstand the severe service encountered on reversing rolling mill work of this nature. The speed range of the motor is 120-0-120 r.p.m., and since the speed is quite slow during a considerable portion of the time, and the momentary current peaks are high, it has been designed for forced ventilation. A Buffalo Forge Co. fan is used, this equipment being placed in a lean-to at the side of the power house.

There is also a flywheel motor generator set, this consisting of a 2,000 h.p. wound rotor induction motor driving a 50,000 pound cast steel flywheel, and a special d.c. generator. This generator is also of the compensated commutating pole type and is designed to withstand the same peak load as the reversing motor.

The exciter set is of 3 piece construction, consisting of a 7½ K.W. exciter, and a 25 K.W. constant potential generator driven by a 50 h.p. induction motor. The magnetic control, main switch board, and air washing outfit are all located in the same building as the motor generator set.

The switchboard and control apparatus is very interesting. The reversing motor is controlled automatically by magnetic switches. Adjustable relays control the rate of acceleration and retardation of the motor, so that it operates at a rate consistent with the reductions which are taken in the mill. The control is so interlocked that the motor always has full field when starting. Further increase in the speed, up to a maximum, takes place after the generator field has attained full strength.

The main switchboard controls the 2,000 h.p. A.C. motor, as well as the exciter and blower motors, and has mounted thereon the necessary meters for measuring the power of the different circuits. Two automatic oil circuit breakers are used between the power line and the primary of the 2,000 h.p. motor. One of these circuit breakers is for forward operation of the flywheel set, and the other breaker is for reversing the power to the set in order to make a quick stop when operating at full speed. This feature is included because it is sometimes desirable to bring the flywheel set to rest quickly, in case of trouble of any kind.

Between the D.C. generator and the reversing motor, an electrically operated high capacity automatic circuit breaker is used. The purpose of this circuit breaker is to interrupt the main D.C. circuit in case of very extreme overloads. The master switch is mounted in the operator's pulpit, and on an inclined panel in front of the operator is a D.C. ammeter and voltmeter for indicating the power transferred between the generator and reversing motor. This panel also has red and green lamps that indicate the position of the main circuit breaker.

The secondary of the 2,000 h.p. A.C. motor is controlled by means of an automatic liquid slip regulator. The position of the electrodes, and thus the amount of resistance inserted, is governed automatically by the torque motor, which in turn is actuated by means of a current transformer in the primary leads of the main motor. If the regulator is set for the average load on the motor during operation of the mill, it will take a constant input from the power circuit as long as the equipment is operating up to capacity. As peaks come on, the torque of the small motor is increased due to the greater current in the primary leads, which raises the movable electrodes inserting more resistance in the secondary. This allows the motor to slow down, and shifts the peak to the flywheel. After the peak has been taken care of, the input to the main motor will be maintained until the set is brought up to approximately full speed.

The excitation for both generator and motor is supplied by the small exciter

GENERAL VIEW OF THE PLATE MILL. E. C. WALKER, THE SUPERINTENDENT, IS A BIG MAN BUT SMALL IN COMPARISON WITH THE MILL.

set. The direction of the roll motor excitation is not changed during operation, but is varied to meet the conditions of load and speed requirements. The operation is as follows: With the flywheel set at full speed, and master controller in "off" position, the roll motor will not be in operation, since the generator has no field current. The motor now has full field and the generator field is gradually excited, bringing up the voltage across the motor armature which will cause the same to revolve in the direction indicated by master switch. Compounding of the reversing motor is accomplished by means of the series exciter, which is excited by the current flowing between the generator and the motor. In this way any variation in the load on the mill motor will vary its total field excitation, thus giving the effect of a compound motor without the disadvantage of reversing such heavy currents in the series winding, which would be required in machines of the usual type. Due to this system, compounding can be varied to suit the operating conditions without the necessity of shunting heavy currents.

The speed at which the roll motor runs is practically proportional to the impressed voltage, independent of load up to full field on both motor and generator. From here, the speed is increased by manipulating the field of the motor. During the pass, the load on the generator is often very much in excess of the average over the entire cycle, and the automatic slip regulator enables the flywheel to supply the difference between the average input to the set and the load on the generator during the peaks. A slip regulator automatically inserts resistance in the secondary of the induction motor when its primary current reaches the average value, so that the speed of the set is reduced, allowing the flywheel to give up a portion of its energy. When the load on the generator decreases below the average for which the regular is set, this operation is reversed, i.e., the difference between output of induction motor and input required by generator goes to bring the set up to maximum speed. By this system, the input to the set may be limited to practically a constant value, independent of peak loads which are several times the maximum load on the line.

The roll motor is rapidly brought to rest by regenerative braking if the voltage on the generator is lowered below that corresponding to the speed of the motor. In pumping back power into the set, a large portion of the accelerating energy is reclaimed, helping each time to increase the speed of the set and consequently the energy stored in the flywheel. A device for accomplishing rapid acceleration is incorporated so that when it is desired to speed up the operation the normal time for building up the generator voltage can be reduced.

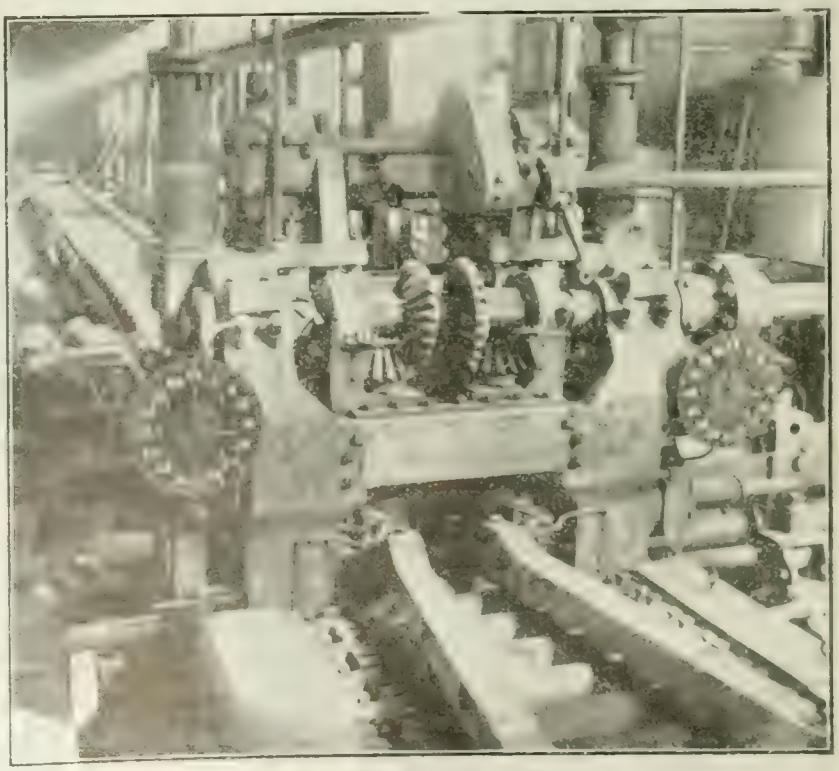
The incoming power is 13,000 volts, 3 phase, 27 cycle, and is brought through an underground cable 1,500 feet from the main substation of the company. It is transformed down to 2,200 volts immediately at the mill power house.

The power for screw down and table D.C. motors is furnished by a motor generator set consisting of a 400 K.W. generator 220 V.D.C. connected to a 590 h.p. synchronous motor 2,200 V, 3 phase, 25 cycle. This also furnishes the power for driving the D.C. motors on all tables, plate leveller, manipulator, furnace pusher, shear depressing table, pinch rollers, etc. Provision is made for installing an additional motor generator set to duplicate this when required.

Various Details

The billet shear used is of Mackintosh & Hemphill design, and was built by the Canadian Allis-Chalmers Co. The capacity of the shear is 10 feet by 10 feet square, and slabs up to 40 inches width can be cut. The stroke is 12 inches, the length of knife 48 inches, and the number of strokes 14 per minute. It is driven by a 125 h.p. induction motor and the clutch shifter is worked by a 9 h.p. D.C. mill motor with brake and limit switch. The shear gauge is also of M. & H. design, and is operated by a 9 h.p. D.C. motor.

The shear depressing table, back of the shear, is 23 feet long with 11 rolls 14 inches by 48 inches. It is driven by a 60 h.p. D.C. mill motor at a speed of



CLOSE UP VIEW OF THE PLATE MILL.

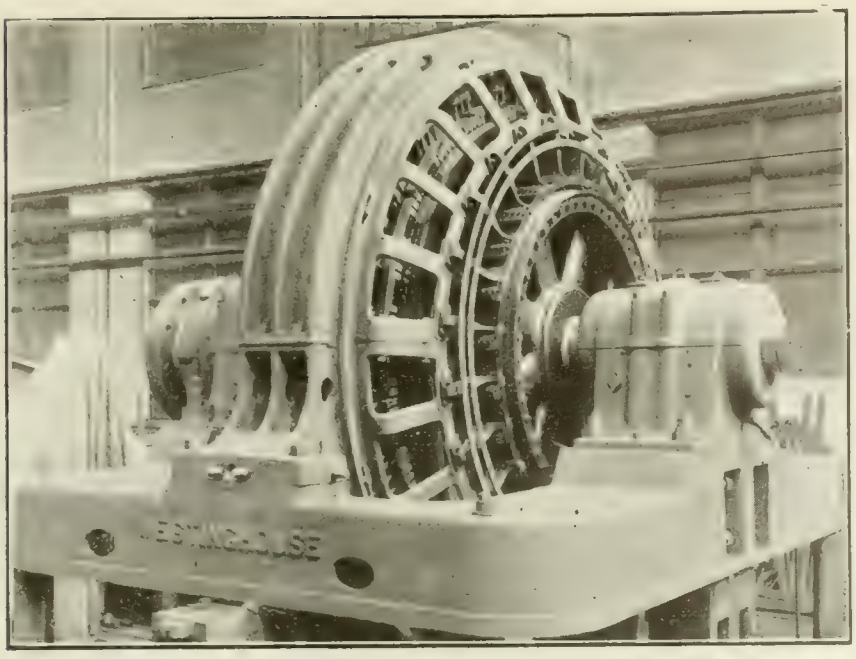
SOME VIBRATION

F. C. Walker, plate mill superintendent at the plant we are speaking of, tells a funny story about vibration. "You are, of course, well aware," he started off, "that a plate mill of any size is always subject to considerable vibration, but you have to actually experience the sensation before you have any conception as to its extent.

"When you stand on the pulpit, or as some might term it, the control bridge, you feel the sway to a nicety. I remember on one occasion the foundations were none of the best, and the vibration and swing was worse than usual. It was like standing on the bridge of a ship during a rather nice swell.

"On reaching home that night I could still feel the sway, but the limit came when I actually woke up in the night to find myself grabbing the bed post firmly in order to keep myself from falling off the pulpit."

The little tale about vibration may seem to the uninitiated as exaggerated, but when we consider that the firm installing this plate mill at Hamilton saw fit to have a 14-ft. deep foundation of reinforced concrete, there must be something to the story. Below the concrete again there is placed considerable piling to a still further depth of 30 ft., this, of course, being to prevent sinking. Good, firm soil must be reached before the foundation proper is poured. In the old days these were of stone, not concrete, but were never as satisfactory as the modern method. Before a foundation is commenced, the ground is carefully drilled to ascertain its quality at different depths. Having this information at hand, they can proceed to drive their piling.



THIS ILLUSTRATES THE 5,000 H.P. REVERSING MOTOR WHICH DRIVES THE MILL.

266 feet per minute. The shear run out table is 45 feet long with 27 rolls 14 inches by 48 inches and is driven by a 60 h.p. D.C. mill motor running at a speed of 266 feet per minute.

The punch rollers are located immediately back of the shear run out table and are 18 inches by 48 inches. These rollers are for delivering skelp, etc., to the piler, the intention being to cut skelp sheet, bar, etc., on the billet shear without going over the hot bed. The speed of rolls is 480 feet per minute.

The shear equipment consists of a cut-off and two side shears with an arrangement of castor beds to serve them. A 10-ton platform scale 5 feet wide and 50 feet long is also arranged for castors.

On account of the variety of products, a diversity of heating furnaces is necessary. A 32-foot continuous furnace with douhle electric charging pusher and delivery pusher places the ingot directly on to the approach table.

The mill tables, front and back, are 35 feet long, each having 20 rolls. The 13 rolls next to the mill are spaced 17 inches, while the balance are spaced 21 inches. All rolls are 14 inches diameter, 72 inches long. The maximum speed of table is 428 feet per minute. The case, and the table beams are made of cast steel and the roll bevel gears, as well as the drive gears, are machine cut cast steel, running enclosed in oil.

Each mill table is driven by two 80 h.p. mill reversing motors, connected in series. These motors have full magnetic plugging control, and are so arranged that the motors on the incoming table work at half speed, while the outgoing table works at full speed in either direction.

The two controllers are mechanically connected, and the operator uses only one handle to operate all four motors. This is accomplished on the first point of the master controller in either direction, and on the second point both tables run at full speed.

The approach table is driven by a 60 h.p. motor. The length of this table is 70 feet and it has 35 rolls spaced 18 inches centers in front of furnaces; while the balance are spaced at 21 inches and 30 inches centers, the latter distance being at the extreme end of table. The speed of this table is 350 feet per minute. There is also an extension to the table, this being 55 feet long, but with no rollers.

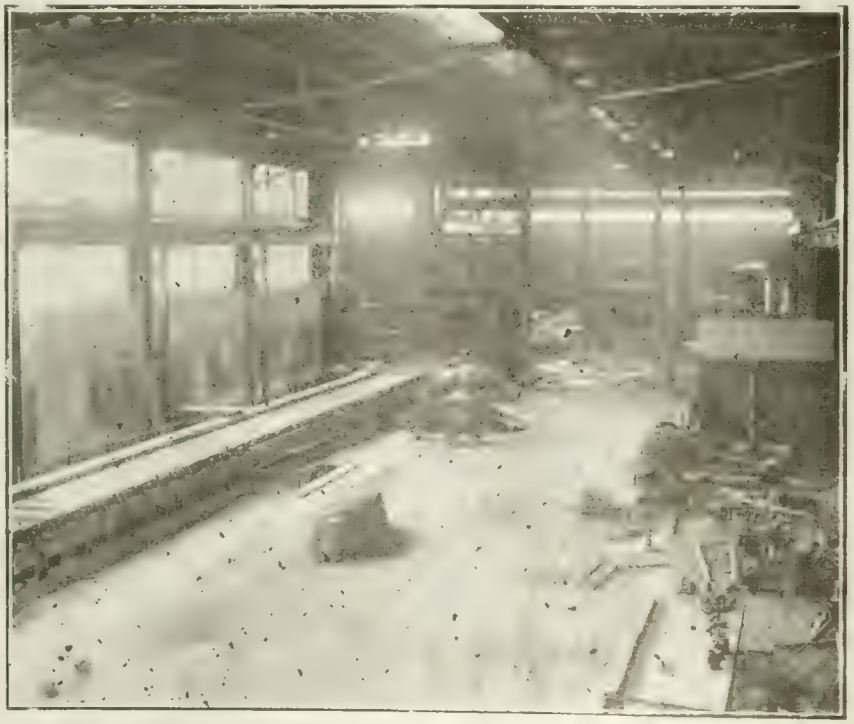
The run out and hot bed tables are each 145 feet long, the former having 58 rolls and the latter 61. These rolls are 14 inches diameter, 59 inches long and the center distance between the rolls is 30 inches. As on the other tables, the gears have machine cut teeth and run in oil. The speed of the rolls is 350 feet per minute. Each of these tables is driven by two 60 h.p. mill type motors connected in series.

A plate leveller is situated between the run out and hot bed tables, and this is a nine roll machine made by R. S. Newbold. The rolls are 10 inches diameter, 72 inches long and their speed is 158 feet per minute. Motor drive and screw down are of course provided. Extended shoe plates are provided to allow for removing leveller and inserting a dead roll when rolling slabs or billets.

A second continuous double skid furnace is installed alongside the first furnace, and is equipped with a hydraulic pusher. This will handle larger blooms and ingots up to 50 feet and the pusher will deliver material directly to the table. The capacity of both these furnaces is about 4,000 to 6,000 tons respectively.

It is the intention ultimately to make provision for four soaking pits, two to be installed later, but the first pits are four hole 6 feet by 9 feet with hydraulic operated covers. These pits are arranged for oil firing with provision for producer gas later. The soaking pit building is located immediately adjoining the furnace building, with the approach table through center, having two pits on each side.

The buildings in which these units are housed are of steel construction and provision is made for extending shipping room as required. The main building extends across the other buildings and is partitioned off from the power house.



PARTIAL VIEW OF TABLES AND MILL. NOTE THE AUTOMATIC SWITCHES ARE IN THE GLASS-PROTECTED BUILDING TO THE LEFT OF THE TABLES.

The power house walls are reinforced concrete and glass with gypsum slab roof and concrete floor. The mill building and power house is served by a 40-ton crane, while other cranes in the plant are of 10-ton capacity.

With the exception of the mill and plate leveller, all the tables, shear pushers, punch roller, and accessory machinery was built in Canada. No doubt readers will remember our Jan. 8th issue in which we told of the work being done for this mill by the Dominion Steel Products Co., Brantford, Canada. The steel castings for the work performed in Canada were supplied by the Dominion Foundries & Steel, Ltd., from their own foundry.

The idea of producing as much as possible in Canada is to be commended, and here is how the work was distributed. The tables, including shear depressing and furnace pushers was made by the Dominion Steel Products, Brantford, Ontario, the shears by Canadian Allis-Chalmers, Toronto; manipulators by John Inglis, Toronto; buildings by Hamilton Bridge Works, Hamilton, Ont.; while the electrical equipment was supplied by the Canadian Westinghouse Co., Hamilton, and the Canadian General Electric Co., Peterboro, Ont.

A good feature of this installation is the railroad facilities provided. Three railway tracks serve the billet yard, shipping department and mill building, while a track runs right into the building at one point.

Briefly stated, the addition of this mill should mean much to Canadian business generally. Billets and blooms from 3 inches by 3 inches to 8 inches by 8 inches, slabs from 2 inches to 8 inches thick and from 6 inches to 40 inches wide are now available, while skelp of all sizes and weights 8 inches and wider can be made. Sheet bar (for sheets) of all sizes and weights can be produced, and universal plate from 7 inches to 41 inches of any thickness and length can be made. In addition to this list, sheared plate 66 inches wide, and of any thickness can be procured. The capacity of the mill being 150,000 tons per year will allow them to handle the demand easily. In fact, when in full swing this installation will be one of the largest steel finishing units in Canada.

Increasing Production by means of Turret Lathe

Possibilities of Such Machines Are Not Realized—Proper Planning of Operation Steps—Machining a Gear, a Clutch, and a Series of Collars—Making Tool Estimate Sheets, Also Time Study Sheets

By E. H. TURNER, Production Engineer for the Canadian Fairbanks-Morse Co., Ltd.

MANY shop men, and even executives are firmly of the opinion that it never pays to use a turret lathe unless you have a large quantity of similar shaped pieces to machine. This is an erroneous impression and the examples in the present article show clearly that in many cases a turret lathe can be used to advantage even on smaller quantities.

There are two reasons why manufacturers in general are not getting the production from turret lathes that they should. First they do not fully realize the possibilities of such lathes nor are they sufficiently familiar with the tools used. The second reason, is, to my mind, a question of the operator. The antipathy often shown by shop men to operate such machines to full capacity has caused many a one to exclaim, "Oh, you cannot increase production on that style of tool." This feeling can, I believe, be wiped out by offering additional wages for increased production, pointing out clearly to the workman that his increase depends on his efforts.

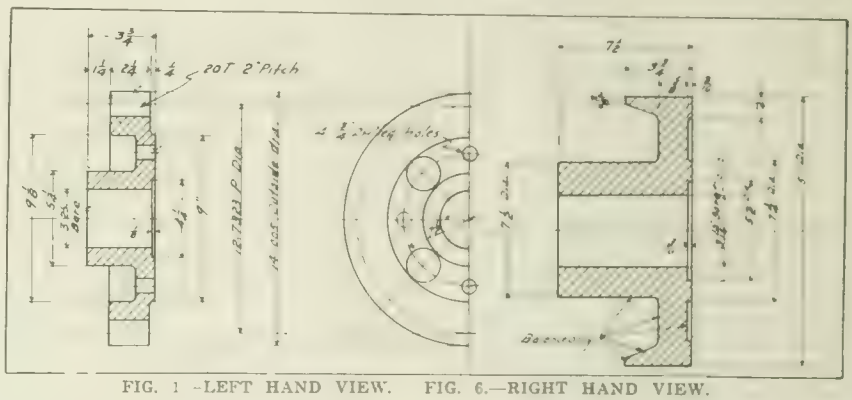


FIG. 1.—LEFT HAND VIEW. FIG. 6.—RIGHT HAND VIEW.

Proper planning of the operation steps is equally important. At all times make the tooling as simple yet efficient as possible. This will enable the operator to complete the work in the best possible time. To accomplish this requires a working knowledge of tool equipment, and such can be obtained in various ways; reading articles on the subject; by obtaining the information direct from the makers, or by practical experience in the shop.

In using pieces A, B and C for examples of work performed, it is intended to draw attention to the following points. First, these parts are taken from the

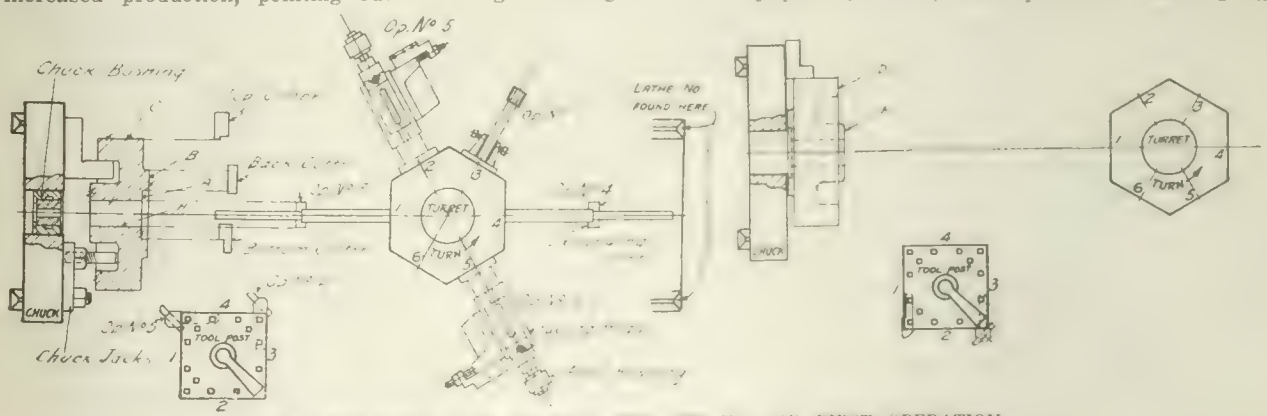


FIG. 2.—LEFT HAND VIEW SHOWING THE SET UP FOR FIRST OPERATION.
FIG. 3.—RIGHT HAND VIEW DEPICTS SECOND OPERATION SET UP.

DETAIL OF TOOL ESTIMATE SHEET

List No.	No. Req.	Tools Wanted
CK-1	3	Standard Hard Jaws.
CK-52	3	Standard Chuck Jacks.
To make	3	⅜ x ¾ Screws and Nuts for Chuck Jacks.
BB-20	1	Rough Bore Cutter, 3.235
BB-21	1	Adjustable Cutter, 3.25.
BB-1	2	Standard Boring Bars, No. 5.
FH-1&3	2	Facing Heads with Top and Rear Tool Holders.
CK-54	1	Standard Chuck Bushing for No. 5 Bar.
To make	2	Each of Flat Cutters for A, B, and C.
FH-65	2	Standard Pilot Bushing Arbours for Lubricated Bushing.
FH-64	2	C.I. Plain Bushings to Run in 3.25 Hole.
TP-42	1	Rt. Hd. Standard Tool Holder.
TP-43	1	Lt. Hd. Standard Tool Holder.
TP-48 & 49	2	¾ x ¾ Tools for Tool Holders.
For Set-up No. 2		
CK-1	3	Standard Jaws.
TP-15	1	Lt. Hd. Roughing Tool.
TP-43	1	Lt. Hd. Tool Holder.

FIG. 4.—AN EXAMPLE OF A TOOL ESTIMATE SHEET.

work of one plant, the machine shop of which is producing very creditable work, both large and small. It might be well to add that all the examples embodied in the article are taken from Canadian plants, and the first three, already referred to, were being made on engine lathes when I first saw them, although the equipment in this plant included a 21-inch turret lathe in good shape.

The second point I wish to emphasize is that similar parts, even if not identical with those shown, are common in many plants throughout Canada. It was for this reason that I picked on these simple examples, believing they would be of greater interest than if I were to show more complicated pieces.

The third point I wish to refer to is this. The tool set up for example A is quite sufficient for machining all the pieces shown, also other similar shaped parts, which of course we have not the time to deal with. All that is necessary is merely a change of boring bar cutters, flat cutters, and tool post tools. The above points will no doubt convince the skeptical that engine lathe work can often be profitably performed on the turret lathe, and that it is not always necessary to have large quantities of one piece to make the change a success.

At Fig. 1 is shown piece A in detail, while at Figs. 2 and 3 we have layout drawings of the first and second operations respectively. The piece as illustrated is a cast steel gear to be machined as shown by the finish marks. Much might be written at this point about the information left off shop drawings, such as type of finish desired, limits allowed, etc., but as this is a turret lathe article let us stick to the main subject. In this case all dimensions given in decimals are to be held within a plus of .005 inch, while the other dimensions are near enough to within 1-64 inch. Originally, these parts were put through the shop in lots of 5 or 6, but it was found easy to arrange for lots of 15 to 20. The layout shown was made for lots of 10.

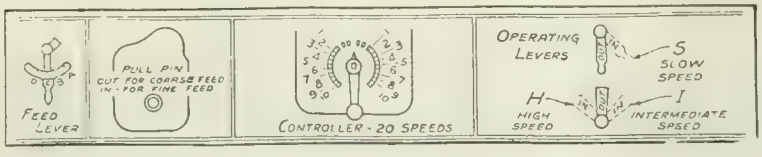
Let us refer to Fig. 2. The first essential in production is holding the work securely. Usually the largest diameter available should be held in the jaws. In this case the inside of the rim of gear affords ample holding surface and driving leverage for all cuts. The work is pressed against the chuck jacks and gripped on the inside of rim as shown on sketch.

Before placing work in position, the chuck bushing must be inserted. This consists of a cast iron outer bushing made an easy driving fit into the chuck plate. Inside of this outer bush is placed a hardened steel bushing having a hole to suitable size for the pilot on the boring bar. This hardened bush revolves in oil and is kept in place by a projection on the rear of the cast iron bushing, and a steel plate on the front end, this plate being held by three small screws. When the bar is in working position the hardened bushing remains stationary with the bar.

The data contained in this article are taken from a Canadian plant, and are typical of almost any machine shop throughout the country. Tool planning is after all the big point to watch, for many a good machine tool is giving far from its possible service through poor tool layout.

Next let us consider the tool post. Here is shown a right and left hand tool holder with the tools 4 and 3 in position. The order of operation No. 1 had best be told in steps. After chucking the work, using hard jaws, the faces of A and B are rough faced with the tool in tool post, side 3. Next the bore H is rough bored with bar at side 1 of the turret. After this the same hole is finish bored with the bar at side 4 of the turret. The fifth step is to start the tool on side 4 of tool post on face C of the work, following ¼ inch behind with the facing head at side 5 of the turret, this turning surface C, and facing surfaces B and A to semi-finished sizes. The last step in the first operation is to finish surfaces C, B and A with tools at side 2 of the turret.

It might be well to add that after face B is machined, the carriage stop was set so that the tool could be brought to the same position each time. The work is always measured from the chuck jaws out. This method of setting the stop likewise applies to the other positions where stops are necessary. It will be noticed that a reamer is shown at side 3 of the turret, but that no mention has been made of the same. The reamer is not used on this particular operation.



Change Gear 32 Teeth	Controller at	Speeds	Spindle R.P.M.	Pull Pin	Feed	Min. Sec.
1. Chuck						2:00
2. Rough A and B Tool Post No. 3	5	I	24	Out	D-1/32	4:00
3. Rough Bore H Turret No. 1	7	I	55	Out	D-1/32	2:30
Above takes ¼ in. from bore.						
4. Finish Bore H Turret No. 4	7	I	55	Out	C-1/16	1:15
5. Rough C and semi-finish C, B and A Tool Post No. 4. Turret No. 2	4	S	14	Out	D-1/32	7:00
6. Finish C, B and A Turret No. 2	4	S	14	Out	C-1/16	3:10
Operating Tools						2:00
Floor to Floor Time for Set-up No. 1 =						22:25
Set-up No. 2.						
Chuck						2:00
Face D and E	4	S	14	Out	D-1/32	5:40
Operating Tools						0:20
Floor to Floor Time for Set-up No. 2						8:00
Total Floor to Floor Time						
1st Operation						22:25
2nd Operation						8:00
Complete						30:25

FIG. 5. AN EXAMPLE OF A TIME STUDY SHEET.

With the exception of a dual holder that could be placed in side 6 of the turret, and a holder for the tool post, this equipment is what is termed a standard set of tools for Gisholt lathes, and the layouts I am describing throughout this article are for this style machine. The set up used on this piece is adopted for all other work shown, the only difference being the changes in cutters and tools.

When work of this nature is planned it is customary to make out a list of tools as shown at Fig. 4. With a list of this kind all tools necessary can be placed at the machine ready for making the set up.

A short talk on the art of setting facing cutters would not be amiss. The quickest method is to use a finished piece, placing it over the pilot bushing and setting all finishing cutters on side 2 of turret first (see Fig. 2), then setting the cutters on facing head at side 5 of turret, allowing of course the correct amount of stock.

It is common practice on work of this nature to prepare study sheets as shown at Fig. 5. In this case the study was made before starting to make the set up, and is based on a cutting speed of 50 feet per minute. Such a list can, however, be made up when the set is being made, or it can be changed from time to time to meet any adverse condition that may arise, or to take advantage of a favorable one. The time sheet shown is for a 21-inch motor driven lathe with D.C. connection. This drive, to my mind, is the most convenient, as the controller has ten speeds in either direction for each position of the levers S, H and I. However, the same plan is adopted if A.C. drive or belt is used. These sheets give complete instructions to the operator. For example in step No. 2 we see that the controller has to be set at position 5, and that under the speed column we have to set lever I, giving us a speed of 24 r.p.m. The next column refers to the pull out pin at end of lathe, this pin controlling the fine and coarse feeds, out position for coarse and in for fine feeds. The next column denotes a letter as used, also the feed to be adopted. The last item gives the actual time of the step in the operation. Allowances for moving tools from one position to the other are made at the end of the time

The author of this article is well qualified to speak on the subject, as he is constantly travelling around Eastern Canada giving service on turret lathe tool planning. He has told Canadian Machinery that this service is free and that any firm desiring information can have the same upon request. Such correspondence should be addressed to him, care of Canadian Machinery Editorial Department.

study, then all items are totalled, this giving the actual floor to floor time. In the case shown, the first operation takes 22.25 minutes, the second 8 minutes, therefore the complete time for the piece is approximately 30¼ minutes. As a general rule a separate set-up sheet is made for each operation, but for convenience we have shown both studies on the one sheet.

Second Operation

Referring to Fig. 3, it will be seen that the only equipment necessary on the second operation is two tools in the tool post at positions 1 and 3. These tools could have been placed during the first operation if so desired as they do not in any way interfere with the others. The equipment on the turret can be left intact. Merely draw the turret out of the way and proceed as follows.

The work is held in the standard jaws, and the faces D and E are completed with the two tools at sides 1 and 3 of the tool post. To machine two of these gears in the regular way requires 3½ hours, but the ten pieces are machined by the turret method described in eight hours, or a time per piece of 48 minutes including all set-up time. This is by no means a record, but when you figure that in many cases two to four hours are often used up in machining even one of such pieces, it leads to the belief that record breaking is not essential if we can make an improvement in production time such as we have shown.

The Second Example

The next example B illustrates a standard cast iron coupling that has to be machined all over. Machining for balance is marked clearly and such parts require only one cut. Other dimensions have to be held to plus .10 inch, except the bore which has limits as shown on the drawing at Fig. 6. Two operations are necessary to complete this piece and following is the sequence of steps.

Referring to Fig. 7 we see the tool layout for the first operation. The work is chucked in standard hard jaws, and the face E is faced to carriage stops by the tool in side 4 of tool post. The bore A is also started by the tool at side 1 of the turret, this being held to a turret stop. Next the surface K is turned by the tool in side 3 of the tool post. The face H is now machined by the tool in side 3 of tool post, also the face F. The surface G is next rough machined by tool in side 4 of the tool post. The surface G is now straightened by the tool in side 2 of tool post. It might be well to add that in withdrawing the boring bar the rapid traverse is used as soon as the turret trips.

As we have already gone into the system of making out a time study sheet we need not dwell on this at great length except to say that following are the times on the different steps. Chucking 2 minutes, face E 1 minute 20 seconds, turn K 4 minutes, face H 2 minutes 40 seconds, face F 30 seconds, rough G 3 minutes, straighten G by hand 1 minute, operating tools 2 minutes. This makes a total operation time of 16 minutes 40 seconds. It will be noted that no time is given for rough boring the hole A as this was performed while the other tools were working.

Operation No. 2

Fig. 8 depicts the tooling used in the second operation on piece B. In this case the work is held by hard jaws and the piece is supported by chuck jacks. The surface B is rough machined to stops, the tool of side 4 of tool post being used. The bore A is next finished with box at side 4 of turret. The same hole is now reamed by reamer at side 3 of turret. The surface C is roughed to stop and E is merely cleaned up. D is next roughed with tool at side 3 of tool post. This is followed ¼ inch behind by tool at side 2 of turret, and surfaces C, D and B are semi-finished. The last step con-

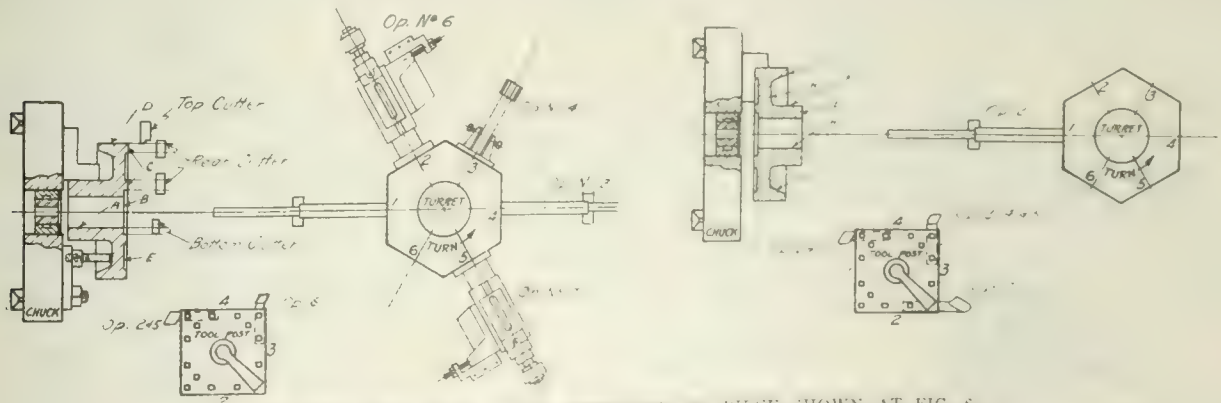


FIG. 7.—RIGHT HAND VIEW FIRST OPERATION ON PIECE SHOWN AT FIG. 6.
FIG. 8.—LEFT HAND VIEW SHOWING SECOND OPERATION ON THE SAME PIECE.

sists of finishing the same surface mentioned with the facing tools at side 5 of the turret.

The time study for this operation follows. Chucking 2 minutes, rough B 25 seconds, finish bore A 1 minute 30 seconds, ream A 1 minute 30 seconds, rough C and clean E 3 minutes, rough D and semi-finish D, C and B 7 minutes 20 seconds, finish D, C and B 3 minutes 15 seconds. Total floor to floor time 20 minutes 40 seconds. This means that to complete the piece takes approximately 36 to 38 minutes, this including both operations. The best time on the former method employed was 2½ hours each, so that the saving is considerable.

The Third Example

Example C at Fig. 9 illustrates a pair of standard cast iron saw collars. The face with a slight hollow near the bore must be true and square with the bore, and in this case the dimensions are not to close limits. Referring to Fig. 10 we see the tool layout sheet for this piece, and here is how the work is completed.

It will be noted that these collars are made from a casting long enough to make five or six pieces. To facilitate gripping the casting is made with a slight bevel as shown and is held in a pair of special jaws as shown. These jaws may be hard or soft as desired. The chuck bushing in this case is kept well to the front in order that the bar may be in as far as possible. Chips and dirt cannot injure such a bushing, if it is of standard design.

After chucking, the face B is machined by tool in side 4 of tool post. This, however, is for the first piece only. The hole A is bored and surface C is turned at side 1 of turret and side 4 of tool post. The bore A is now finished, and surface C by bar at side 4 of turret and tool at side 3 of tool post. The reamer at side 3 of turret now reams 3 inches into bore A. The face B is next faced to form by tool at side 2 of turret.

The piece is now parted at P by tool at side 2 of tool post. The eighth step is the reaming of other 3 inches into hole A by reamer at side 3 of turret. Face B is again formed and then the work is parted halfway down at P by tool at side 2 of tool post. E is next formed by tool at side 3 of tool post. The parting off is

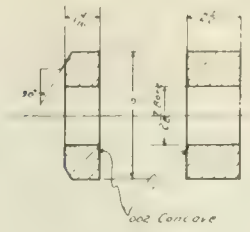


FIG. 9.

now completed by tool at side 2 of the tool post.

The time for the plain piece is about 9 minutes, while 11 minutes is approximately the time for the bevelled collar. There are a number of such collars of different sizes made at the plant I speak of, but the same equipment is easily adaptable to all. Many other examples of work even more complicated could be given, but sufficient has been said to emphasize the importance of studying the possibility of turret lathes.

To give readers an opportunity of making a layout for themselves, also a time study along the lines that the author has shown, we have prepared the examples D and E at Fig. 11. These pieces are at present produced on a 21-inch turret lathe, and it would be interesting to see comparative tool layout suggestions, showing these in a later issu with the present method employed. The preparation of such sheets would quicken the perception of the mechanic and Canadian Machinery will pay for all accepted material at regular space rates. Here would be the best method of submitting the material. Read the article carefully, cover the same points embodied in this work, make your layout sheets, give all possible data, then send it in to our office. After we have received a sufficient number of suggestions, we will publish the best of these, together with the present method of production.

ERRATA

In our January 27th issue we published an article on the machining of monel metal castings. In this article we omitted giving credit to American Machinist, who were the first to publish the material. This was an oversight on our part; in fact, a footnote was prepared but was left out by mistake.

ZINC SMELTING

Speaking on the spelter situation, Mr. H. M. Ridge in the "Journal of the Society of Chemical Industry" remarks that until conditions improve, the Old Country is dependent upon America for its supply. He points out that it will be some little time before either the British or Belgian works will be able to produce at full capacity. He states that no steps have yet been taken to make the country self-supporting, even although there are ample supplies to be had within the empire. He compares the various countries and remarks as follows:

"In the treatment of zinc concentrates no radically new methods have yet proved suitable. Electrolytic precipitation has been tried in a number of works in the country, but all of these have been shut down, including the Hoepfner process plant at Winnington, from which such a good product was obtained for several years. It is interesting to note that at the same time electrolysis has been adopted for the new plants in Tasmania, Canada, and at one place in the United States, but in each of these cheap power is available. The demand for high-grade zinc will be large in future, but it can now be obtained cheaply by new means which were worked out during the war. Much progress has been made with the electric-furnace reduction in Norway, Sweden, and France, and the troubles experienced in the condensation of the zinc vapor have been largely overcome, but here also cheap power is essential.

Charging the pots in the furnace probably used to be the most laborious work of the zinc smelter, and this has been overcome with the aid of charging machines. These are driven electrically, and are much more efficient than hand-charging, the pots being more uniformly charged and the charge denser. The duration of the manoeuvre is shortened by about two hours.

The more extensive use of machinery reduces the number of men, and at the same time makes the management more independent of the skilled workmen.

Before the war, 84½ per cent. of the total imports of South America came from European countries.

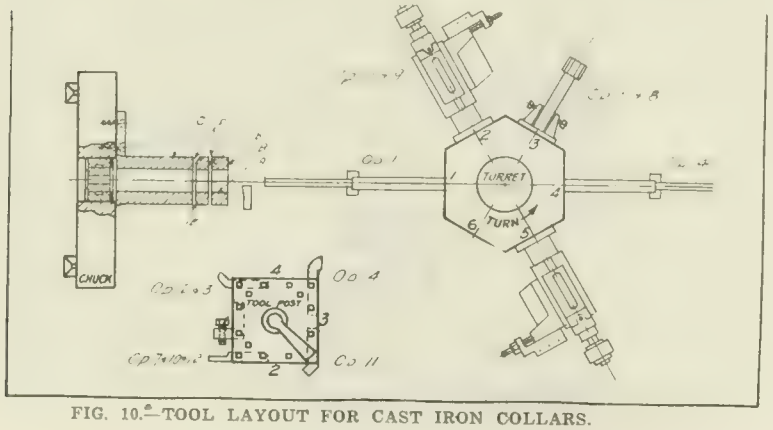


FIG. 10.—TOOL LAYOUT FOR CAST IRON COLLARS.

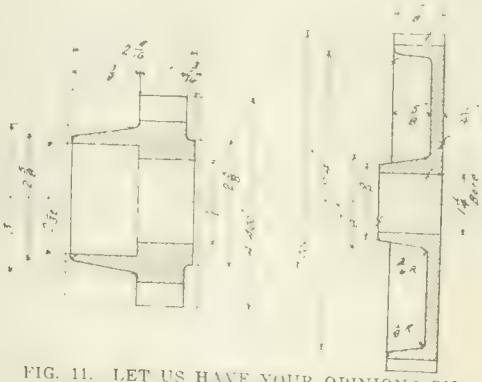


FIG. 11. LET US HAVE YOUR OPINIONS ON HOW THESE PARTS SHOULD BE MACHINED.

Operation of Railroads Under War Conditions

Actual Experiences—Locomotives Used—Necessary Repairs Often Unobtainable—How Absence of Power Brakes on Cars Was Overcome

*By Capt. A. H. Kendall, M.C., O.C. Master Mechanic C.P.R., Montreal

FIG. 2.—TYPE OF LOCOMOTIVE FIRST SUPPLIED.

THE chief object of this article is to describe the actual experiences of a railway operating division under the severe and constantly changing conditions incidental to war manoeuvring. The original staff of the Canadian railway unit, for example, consisted of 3 officers and 266 men, and at the signing of the armistice this had increased to 17 officers and 1,567 other ranks, in addition to a large number of Chinese coolies and German prisoners, for the handling of coal, ashes, etc. Let me relate some of the engineering features in connection with the work of this unit.

"On arrival at Merris we found a railway yard of sixteen sidings, eight on each side of the main line, and a wye off the south yard. Off the south leg of the wye were three parallel sidings, two of them were 14 ft. centres and the third 20 ft. These three sidings were used as a locomotive depot, or locomotive despatch station. There were no shelters or other facilities available. Alongside these tracks was an irrigation ditch, with about two feet of water, full of vegetable matter, from which our water supply was obtained by means of Merryweather pumps. Merris was developed into a headquarters exchange and locomotive depot. Sub-depots were later established at Bailleul, Steenwerck, and Berguette. The latter station had previously been used by the Nord Railway as a divisional point, and it was, therefore, only necessary for the British army to improve the water and track facilities to meet their requirements.

"In developing the locomotive depot at Merris two 150 ft. concrete pits were put in at the end of the two sidings mentioned above. The sidings were extended, and over the pits we erected a sheet iron shelter, so that when necessary to make repairs at night lights could be used without being observed by hostile aircraft. Another shelter made of the same material was erected close by for use as a machine shop. A 50 kw. electric generator was obtained and used for supplying light for the depot; switches were placed so that all the exposed lights could be turned out during night raids.

"A washout pit was constructed. Engines were washed out every ten days and for this purpose a Merryweather pump, as shown in Fig. 1, was used. It may be said here that this little pump was one of the best friends of the railway men in France, for at times we were put to great inconvenience on account of failures to water supply. These pumps were made in two sizes of 5,000 and 10,000 gallons capacity per hour. In addition to the pumps in constant use we had several others in stock for use on the line in cases of emergency. Water tanks were erected, and kept filled by these pumps until such time as more permanent arrangements could be made. At Merris we later obtained a plentiful supply of very dirty water from the canal at Hazebrouck, five miles away. Oil burning pumps were installed at the canal and the water was forced through a ten-inch pipe line, which also had to be installed. At Merris a hole was dug in the ground and lined with canvas well tarred to hold a supply of 150,000 gallons, for use in case of emergency. This reservoir was filled to overflow from the tanks.

Locomotives Used

"The locomotives supplied for work in this area varied in type, and the accompanying illustrations show the general dimensions of four of them. The 0-6-0 Midland railway engine, figures 2 and 3, was the type supplied when we first started operations. Of the fifteen engines of this type assigned to us several railways were presented—but the general design was similar. All these engines had slab frames and were inside connected. They had white metal bearings throughout and a spring boiler was used in the tender boxes and dope

*An abstract of a paper presented before the Canadian Railway Club in Montreal. The author was with the 58th Broad Gauge Operating Co., of the C. E. F.

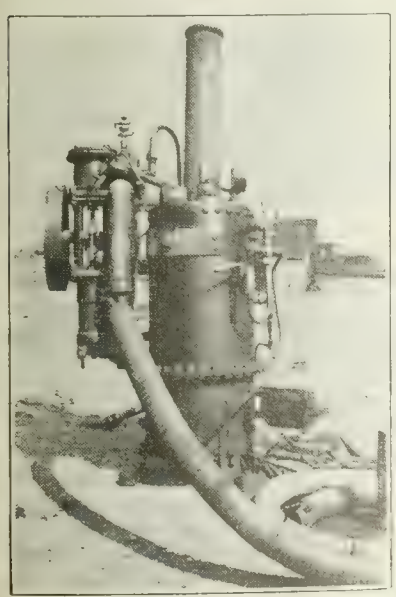


FIG. 1.—SHOWING STYLE OF PUMP USED.

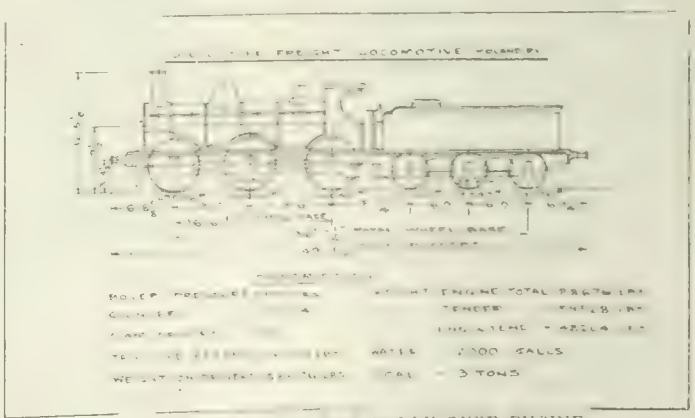


FIG. [illegible] OF THE EARLY TYPE ENGINE

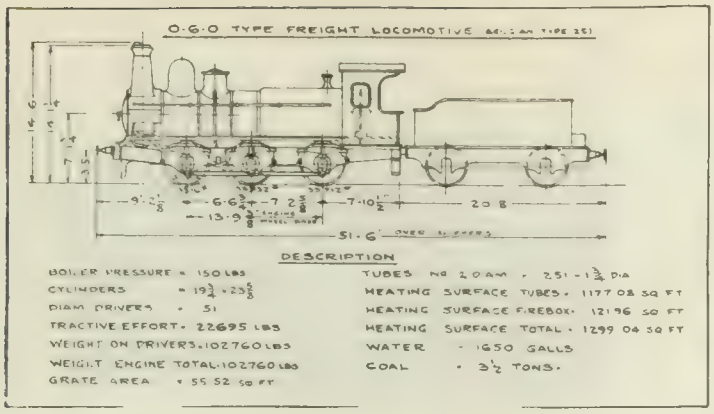

0-6-0 TYPE FREIGHT LOCOMOTIVE
DESCRIPTION
BOILER PRESSURE = 150 LBS
CYLINDERS = 19½ x 25⅝
DIAM DRIVERS = 51
TRACTIVE EFFORT = 22695 LBS
WEIGHT ON DRIVERS = 102760 LBS
WEIGHT ENGINE TOTAL = 102760 LBS
GRATE AREA = 55 52 SQ FT
TUBES NO 240 AM = 2 51 - 1¾ DIA
HEATING SURFACE TUBES = 1177 08 SQ FT
HEATING SURFACE FIREBOX = 121 96 SQ FT
HEATING SURFACE TOTAL = 1299 04 SQ FT
WATER = 1650 GALLS
COAL = 3½ TONS.

FIG. 4.—BELGIAN TYPE 25 ENGINE

FIG. 5. THE BALDWIN TYPE USED LATER

in the main boxes. Wool waste could not at times be procured and as a substitute we used hemp rope, stripped, bound in stacks, and stood on end. This was only a fair substitute, but it met requirements. The tubes and fire box sheets were mostly made of copper and when the boiler was kept clean they gave very little trouble. The chief maintenance repairs were driving boxes, side-rods and springs. Prepared white metal was kept in stock ready to be melted for all bearings. At times it was most difficult to obtain the necessary repair parts and we occasionally had to run engines with one or more springs missing, with the engine blocked up on hard wood. The springs on this type of engine were separately hung and readily adjusted by tightening or loosening the nuts on each hanger.

"The brake equipment was either steam or vacuum. We had, however, several Belgian engines, as illustrated in figure 4, with no braking power whatever on the engine and only hand brakes on the tender, the shoes of the latter being made of wood. Another Belgian engine in service was equipped with Westinghouse air brakes and this was used for personnel and ambulance trains. The 2-8-0 Baldwins, shown in figures 5 and 6, and Canadian built engines superseded the above mentioned classes of engines for handling through traffic. The 2-6-2 Baldwin engines, illustrated in figures 7 and 8, were used for short runs, and as they were delivered new the maintenance was not heavy. The engines were never killed except for boiler or grate repairs, but were kept constantly under steam for use on short notice. Where possible engines were double crewed, but when traffic was very heavy and men were scarce, all were pooled.

"As previously stated, Merris exchange yard consisted of sixteen sidings, which were 1,400 feet long. The chief control, or despatching station, was located here, and telephone communication established with all stations, the Nord Railway and the army signal systems. When a train left the despatching station, Boulogne for instance, Merris exchange was advised of the number, the consist, and the leaving time. Passing reports were also received from the reporting station on Nord lines. On arrival of the train at Merris the despatching station engine was taken off, sent to the locomotive depot, and made ready for the return trip. The crew was given eight hours rest, and when possible, a hot meal and 24 hours' rations before making the return trip. In the meantime the train was marshalled in the yard according to requirements.

"To overcome the absence of power brakes on cars, trains had to be made up with a brake van on each end, and with sufficient cars with hand brakes properly spaced throughout the train to provide the necessary braking power. A small white light was placed below the buffer beam on the front of the engine, and one red light on the rear of the train. The train crew consisted of a conductor and one or more brakemen, the former in the front van and the latter at the rear or on the braking cars. The engineer, not the conductor, was primarily responsible for the train.

"On Nord lines, trains were handled on the automatic system, and on the railroad operating divisions on the station block system. The latter were divided into sections, and at each station, hand, or at night, when possible, lamp signals were given to engineers in accordance with the prescribed rules. No engineer was permitted to proceed into a section until he was furnished with a train order, printed in French and English, indicating that the section was clear or occupied. In event of the section being occupied it was necessary for the engineer to proceed to "Caution" after signing the train order. The engineer's copy of the train order was handed by him or his fireman to the station master or blockman at the end of the section to which it referred. It was permissible to run all trains at "Caution," with the exception of ambulance trains, which were always handled on the absolute station block.

"When possible, trains were run at regularly spaced intervals throughout the 24 hours, but for obvious reasons traffic had to be suspended for a time, and then the trains unavoidably fleeted. Although traffic for the front was of the first importance, the shortage of equipment made it necessary to avoid delay to return empties as much as possible. Weekly census was taken of the waggons, and the compiled report was forwarded to the "Commission de Reseau du Chemin de Fer du Nord" at Paris, and a summary wired to R. O. D. headquarters.

"Traffic was usually heavier at night, particularly forward of exchange stations, and on account of shell holes, and other track breaks caused by bombs, the movement was somewhat slower than in the daytime. When these breaks in the track occurred telephone lines were usually torn down by the force of the explosion and communications cut with the stations beyond. The tracks were patrolled by track walkers, and gasoline track motors were used ahead of trains, when available. Notwithstanding all the precautions taken, however, an odd train on the block of an-

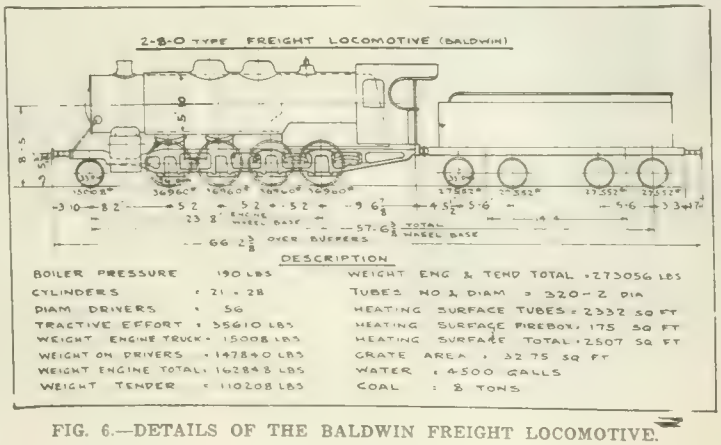

2-8-0 TYPE FREIGHT LOCOMOTIVE (BALDWIN)
DESCRIPTION
BOILER PRESSURE = 190 LBS
CYLINDERS = 21 - 28
DIAM DRIVERS = 56
TRACTIVE EFFORT = 35610 LBS
WEIGHT ENGINE TRUCK = 15008 LBS
WEIGHT ON DRIVERS = 147840 LBS
WEIGHT ENGINE TOTAL = 162848 LBS
WEIGHT TENDER = 110208 LBS
WEIGHT ENG & TEND TOTAL = 273056 LBS
TUBES NO 1 DIAM = 320 - 2 DIA
HEATING SURFACE TUBES = 2332 SQ FT
HEATING SURFACE FIREBOX = 175 SQ FT
HEATING SURFACE TOTAL = 2507 SQ FT
GRATE AREA = 32 75 SQ FT
WATER = 4500 GALLS
COAL = 8 TONS

FIG. 6.—DETAILS OF THE BALDWIN FREIGHT LOCOMOTIVE.

FIG. 7.—THE TYPE OF ENGINE USED FOR SHORT RUNS.

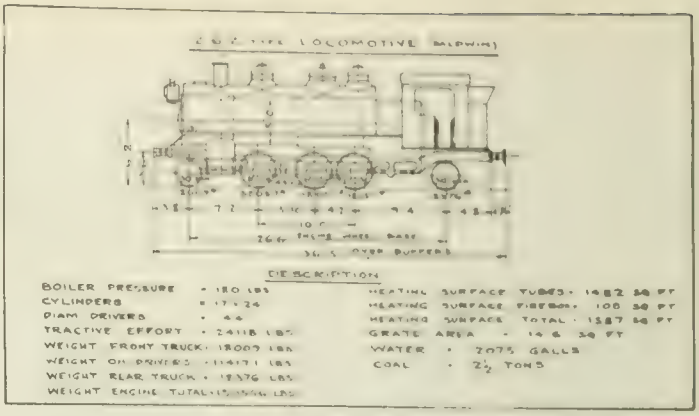


FIG. 8.—DETAILS OF SHORT RUN LOCOMOTIVE

other train, which had passed safely, would run into a shell hole without anyone being warned that the shell had landed. Engineers were sometimes required to take a train over new and unfamiliar lines in the forward areas, without a pilot, and on which they would discover heavy grades and sharp curves. On descending the locomotive would whistle for brakes and trust to luck to find their train still on the rails at the bottom. Some of the forward area grades were 2.5 per cent., and unless the trains were marshalled with sufficient brake vans the result was obvious. The absence of lights on switch stands at stations, etc., made operations all the more difficult. It was often necessary to divert traffic from one line to another on account of the tracks being badly blown up in places.

"In the extreme forward areas it was necessary to cover the cab with a large tarpaulin in order to baffle the light caused by opening the firebox door. In this service below Messines Ridge we had two engines equipped so that the exhaust could be turned back into the tender, so that during periods of inactivity on the front we were able to get trains of ammunition up closer with a minimum noise.

"Locomotives were also used to stand by railway mounted guns, and in this area we had as many as eight, ranging from 9.2 in. to 14 in. When the large guns went into action locomotives were used to spot them after each shot was fired, also to move the guns to alternative positions in the event of their location being discovered by the return fire of the enemy."

"When the advance on the Somme got under way we were advised by headquarters to get ready to move. We then went to the fourth army area and established headquarters at Chemin Vert; a British railway exchange yard just off the Amiens-St. Quentin-Nord main line at Weincourt. The advance in this area was, of course, very rapid, and upwards of 15,000 railway construction troops were used in this area to get the railways back into serviceable condition. Every rail had been put out of commission, bridges blown up, timber burned, deep fills mined and blown up, water systems destroyed, etc. Trains of supplies and ammunition were moved up the same day the rails were laid, even before the track had been lined or surfaced. It will therefore be understood that there were some derailments, but there were plenty of men and material available to do the rerailing. If the equipment was off the track very badly and we did not have time to handle it, the equipment was moved clear of the track and traffic handled as usual until we could get the wrecking cranes into service without causing much delay to traffic.

"Until the Somme River was reached great difficulty was experienced at Chemin Vert on account of the lack of water. We procured two tank trains and had to send them to Amiens daily to be filled with water. Deep wells were sunk, but the chalky formation of the soil, even when water was discovered, made it altogether unsuitable for use in locomotive boilers without first being given treatment. Pumps were later installed near Mericourt and a pipe line laid from the Somme River to Chemin Vert.

"On account of the rapid forward movement of the army it was necessary for us to send out additional detachments. The first one was sent to Omiecourt, near Chaulnes. The main local depot and exchange yard were built at Omiecourt, just off the Nord line. The line from Amiens to Chaulnes was left for operation by the Nord railway. The lines built by the railway troops in this area and taken over for operation by us, extended from Chaulnes through Peronne to St. Quentin, together with all British army lines in this area east of the line mentioned. Omiecourt, plan of which is shown in figure 9, was developed as the main locomotive and exchange depot in this area. The facilities at Omiecourt consisted of an incoming and an outgoing yard with ten 1,800 ft. sidings in one and 12 in the other, a coal ramp with a capacity of 1,000 tons, a concrete reserve water reservoir with a capacity of 25,000 gallons, and two ele-

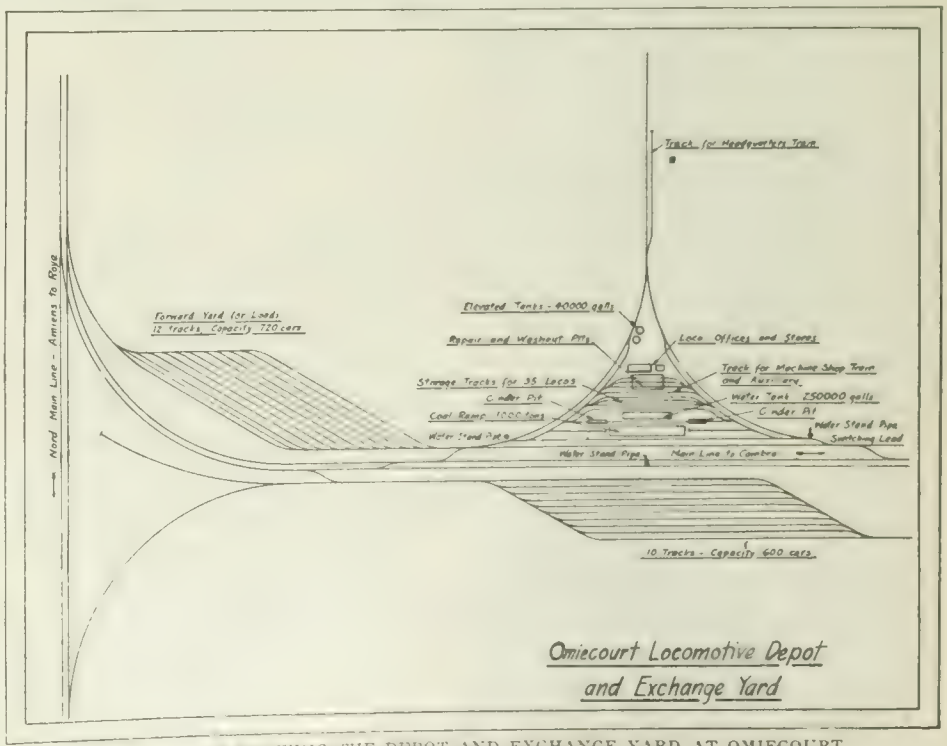

Nord Main Line - Amiens to Roye
Forward Yard (or Loads)
12 tracks, Capacity 720 cars
Elevated Tanks - 40000 galls
Repair and Washout Pits
Loco Offices and Stores
Storage Tracks for 35 Locos
Cinder Pit
Coal Ramp 1000 tons
Water Stand Pipe
Water Tank 250000 galls
Cinder Pit
Water Stand Pipe Switching Lead
Water Stand Pipe
Main Line to Combles
10 Tracks - Capacity 600 cars
Omiecourt Locomotive Depot
and Exchange Yard

FIG. 9.—PLAN SHOWING THE DEPOT AND EXCHANGE YARD AT OMIECOURT

vated 20,000 gal. tanks; these latter tanks being filled by raising water from five deep wells. The locomotive depot was constructed so that 100 locomotives could be taken care of. The machine shop equipment was fitted up in large French steel brake vans and was readily transferred from one depot to another when required. The power was obtained from an electric generator run by gasoline engine. We also had a 35-ton steam crane, which was the largest one in use. The heaviest traffic was handled through this yard during the week ending October 3rd, 1919, this being made up of the following cars: troops and remounts, 2,490; supplies, ordnance, ammunition, and general traffic, 9,921; construction material, 884; ambulance 1,605; a total of 14,900 loaded cars.

"One of the drawbacks to the prompt handling of traffic in this area was the explosion of numerous delay action mines placed in embankments by the enemy when retreating. Although they had destroyed the steel and ties they had also mined nearly every fill of any size, as well as many junction points, diamond crossing locations and bridges. Even when bridges were blown by them other delay action mines were left to blow the new bridges, which they knew would inevitably be constructed. There were various types of mines, but they all had the acid timing arrangement. One of the biggest mines blew up the double main line near Marchelpot as late as January, 1919. Taking into consideration, however, the large number of mines placed, the unit was fortunate in only having had three locomotives wrecked through delay action mine explosions. At the signing of the armistice the unit had 101 locomotives in service. On the first of January following demobilization was started and this was completely carried out and the lines turned over to the Nord railway, and the Canadian railway unit entrained for the base on April 8th, 1919."

In the discussion that followed the reading of this paper some very interesting points were brought to light. Speaking on the class of men recruited for the R. O. D., Mr. Kendall said:—"We found that the men would have to apply themselves to all kinds of work, such as cooking, mending shoes, and various other incidental duties. For instance, we found that we had a road foreman of engines as chief cook. A chief clerk to a general superintendent was a call boy, but it was soon realized that the men who took up in the proper spirit the duties that were assigned to them at the start were the best men. We never had any complaints."

To illustrate the improved conditions resulting from the transportation problems being taken over by the R. O. D. we give the remarks of W. N. Dietrich, late C.S.M., 58th B.G., O.C.: "The most important section of the railway in the north of France for the use of the Allies was that connecting the sea ports of Calais and Boulogne with the cities of Bailleul and Armentieres. Before Capt. Kendall's arrival it had taken two days, or 48 hours, to handle shipments over the section. When he took it over and got things in working condition the trains were operated on a seven and a half hour schedule, and this was later reduced to seven hours, and notwithstanding the traffic was very dense, the total detentions for a week only amounted to a few minutes."

GRAPHITE AS A LUBRICANT

All criticisms of graphite can be traced directly to its impurities. The impurities in lubricating graphite my be divided into two classes: those that have a positive abrasive effect and those that act neither as abrasives nor lubricants. Artificial graphite may be made very high in carbon, but since it is a by-product of the electric furnace process of making silicon carbide, it is likely to contain traces of this, which is very objectionable, as silicon carbide is one of the most abrasive substances known. In the natural graphites the objectionable impurity most commonly found is silica, or common sand. So says Brass World, which continues as follows:

The harmfulness of the impurities depends also on the size of the particles. If the size of the abrasive particles in a graphite is greater than the average thickness of oil film, their abrasive effect will be greatest in a bearing running under uniform pressure. On the other hand, in a reciprocating bearing under high duty, where the oil film is alternately broken and restored, all the different sizes or particles of the abrasive material may come into play, and it is in the latter class of bearing that pure graphite is most essential and that abrasive impurities are most harmful.

Among the many impurities in the natural graphite we find some that are not, by nature, abrasive, but are undesirable and injurious to bearings. To illustrate, let us take the particle of a so-called flake graphite, where we have alternating layers of mica and graphite held together in a manner capable of sustaining considerable compression. Let us imagine stoking an engine at night with a layer of these laminated particles between a heavy crankshaft and a babbitt or lead bronze bearing; the inevitable result will be "pockmarking" of the bearing surfaces. The effect on a reciprocating bearing would be equally undesirable; and it will be readily seen that the jamming effect produced in a ball bearing by the use of this graphite would be ruinous.

For lubrication, the graphite should be such as to permit an infinite divisibility while in contact with bearing surfaces. It should be uniformly fine enough to practically maintain suspension in the oil or grease, so as to permit of the application of the lubricant without undue difficulty due to settling, and it should be fine enough to enter properly between the bearing surfaces without clogging; this will allow it to flow freely in the oil film between the bearing surfaces. For all ordinary lubrication with the lighter grades of machinery oil, none of the graphite particles should be coarser than 0.0003 inch; grades of graphite used with greases or heavy oils would be satisfactory if ground considerably coarser, owing to the correspondingly thicker oil film which exists with these lubricants.

SMALL ELECTRIC FURNACE

A convenient laboratory electric furnace for temperatures up to 2,300 degrees Centigrade is described in a recent issue of "Chemical and Metallurgical Engineering." This furnace is of the granular coke-resistance type and uses 1-inch graphite electrodes, and 1¼-inch graphite crucible. The rods, supported by suitable sized pipe-fittings, pass through silocel brick, and continue to within 1½ inch of the crucible. Granulated coke is used to fill the space around the electrodes and crucible. The crucible is made by sawing off a length of graphite rod of desired diameter, and drilling out the centre in a lathe. The entire furnace is constructed of 9 in. by 4½ in. by 2½ in. silocel blocks, and is heated by an air-cooled, step-down 2.5kva. auto transformer. The primary is wound for 220 volts, having eight different taps for connections which give a voltage range of from 20.7 to 38 volts on the secondary.

This arrangement does not require the use of any outside resistance, as the current and temperature are controlled by means of the various contacts on the primary winding, and also by varying the pressure of the electrodes on the granulated coke between the electrodes and the crucible. The transformer is connected to the furnace electrodes with stranded copper cable. The corresponding amperes for the eight steps on the primary winding range from 65 to 120 amperes, or from 78 to 144 amperes, with 20 per cent. overload, which may be drawn for short intervals (20 to 30 minutes) without hurting the transformer. Temperatures as high as 2,200 degree to 2,300 degrees Centigrade have been obtained from the above, from a cold start, in 20 minutes.

ERRATA

In the February 24th issue, page 35, we made the following statement: "A great advantage of ball bearings is the saving of power. The University of Wisconsin made a test some time ago which illustrated that Roller Bearings required the least amount of power."

It is self-evident that this was a typographical error, as what was intended was Ball Bearings, not roller bearings. We make this announcement so that readers will not get confused and will be able to follow intelligently the second portion of the article on ball bearings which will appear March 17.

A New Method of Case-Hardening Steel

Recent Development in the Carburizing of Steel—Greater Speed, Uniformity, and Depth Are Claimed—Factors Governing Case Hardening and Present Methods in Use

*By W. J. Merten, Metallurgical Engineer, Westinghouse Electric and Manufacturing Co.

IRON and low carbon steels absorb carbon from so-called carburizers very readily when in contact with these carbonaceous materials at temperatures above the upper critical point (Ac_3). The quantity of carbon absorbed depends upon:

1. The temperature or degree of heat above the Ac_3 point of the steel; or, in other words, the higher the temperature the faster and deeper the penetration of the carbon. This temperature is high enough to change the iron to gamma iron, which is capable of forming a solid solution with carbon or cementite. Beta and alpha iron do not absorb carbon to an appreciable extent.

2. The character of the carburizer is a very important factor in the successful conductance of case-hardening. Elementary carbon as such is only of secondary importance. Oxygen and nitrogen compounds, which are added or are naturally present in the so-called energizers that form carbonaceous compounds with solid carbon, are necessary to generate nascent gaseous carburizing mixtures of carbon monoxide and cyanogen gas (CO and CN). Flourishing industries are built up on the production of these carburizing materials and energizers.

3. The percentage of carbon present in the steel to be case-hardened has also a marked influence upon the affinity of the the material for more carbon up to saturation. More specifically, a low carbon steel absorbs faster than high carbon steel.

4. The presence of chromium, tungsten, or manganese accelerates the absorption of carbon since these elements form double carbides with iron. Nickel and silicon, however, retard the absorption. The fact that they form solid solutions with iron may be the cause for this retardation.

From the statement under paragraph (2), which states the necessity of nascent carbonaceous gas formation for penetration and absorption of carbon, it is readily conceivable that, if a properly heated piece of steel be brought into contact with pure nascent gas continuously generated in a separate unit or chamber and preferably under pressure, the conditions for case penetration would approach the ideal. A process of this type is the one presented in this paper; but before giving the description a survey of the processes now in vogue with their disadvantages and deficiencies seems to be appropriate.

*Presented before the Pittsburgh Chapter, Heat-Treaters Research Society, Sept. 9, 1920.

Present-Day Methods of Case-Hardening

First Method. The most general and commonly used method of case-hardening is conducted by packing steel parts in a metal box filled with carburizing materials, and then firing the tightly closed box and contents at a sufficient high temperature for a length of time adequate to give the desired depth of case. This process is quite simple and assures fair success if properly conducted in accordance with a prescribed procedure, experimentally determined to give certain definite results under definite and specific conditions. The disadvantages of the process are:

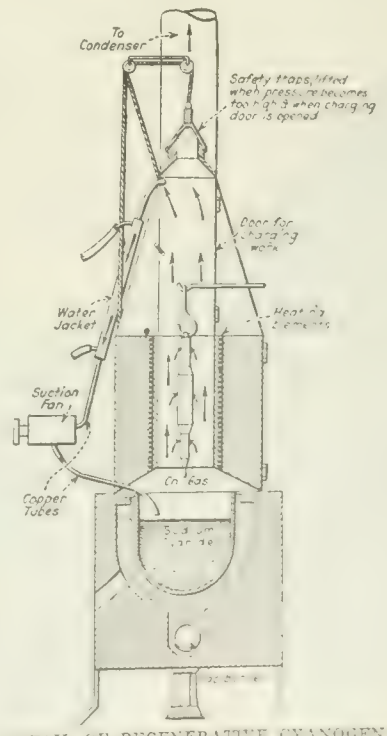
1. Uncertainty of obtaining the proper reaction within the closed box.

2. Difficulty in duplication of results as pre-determined, because of non-uniformity of carburizers.

3. Long time exposure of the steel to a heat not well controllable produces a questionable structural condition.

4. High cost of operation because of the inefficiency of the heating method, the cost of the boxes and the rapid deterioration of them by oxidation or scaling.

Second method. Another method of case-hardening is performed by immersing the steel article in a cyanide bath heated to about 860 deg. C. (1,580 deg. F.). This process is convenient and effective on small articles only and where the depth of the case required is not more than 0.005 in. to 0.015 in., or where mere surface hardening is wanted. This is a fast case-forming method, and from 10 to 15 minutes gives the desired depth. The outstanding disadvantage of this process is that no uniform case can be produced. The parts deep in the melted bath do not get the same penetration as the parts near the surface. The evolution of the cyanide gases at or near the surface favors the penetration, and it is hardly feasible to have pots with a large enough surface area to take care of the case-hardening work of an entire plant.



DETAIL OF REGENERATIVE CYANOGEN GAS CARBURIZING FURNACE.

Third method. The third method consists of dipping of a cherry red piece of steel or tool into a container of a powdered cyanide salt, such as potassium cyanide, sodium cyanide or ferro and ferri cyanides; or sprinkling the powdered salt of these cyanides on the red hot steel furnace and putting the steel back into the fire again. The case-hardening produced in this way is but a very superficial one, and resistance to excessive wear cannot be expected.

Fourth method. In the fourth method the carburizing gases are passed over a piece of steel heated in a retort. This process is applicable to parts that are intricate in design.

All these processes serve the needs of the different industries more or less satisfactorily. Box case-hardening is at best dirty, wasteful and unsatisfactory in a number of instances. Case cyaniding by firing in fused cyanide salt is inefficient, unreliable, dangerous and costly. Retort case-hardening with carbonaceous gases is a step in the right direction, but it leaves something to be desired on account of the selection of the carbonaceous gases and the method of application.

Cyanogen Gas as a Carburizer

The process to be discussed next, although still in the experimental stage, owing to radical changes in the principle employed, appears to present opportunities for efficiency, preservation of the product, simplicity of operation, assurance of uniformity and duplication of results, speed of operation, reasonable cost, and wide range of utility. We may call this process a regenerated cyanogen gas case-hardening.

It has long been recognized that the most effective carburizing gas is cyanogen (CN), that by it a case can be produced more rapidly, with greater uniformity, and with deeper penetration

A.W.
Their Reputation Encircles the Entire Globe

ENGINEERS
SMALL

Gear Cutters
Reamers

The **High Speed Steel and Carbon Steels** use
in our tools are the result of many years of **actu**
manufacture and careful research in our ow
mills. Therefore the quality is assured.

Our Nam

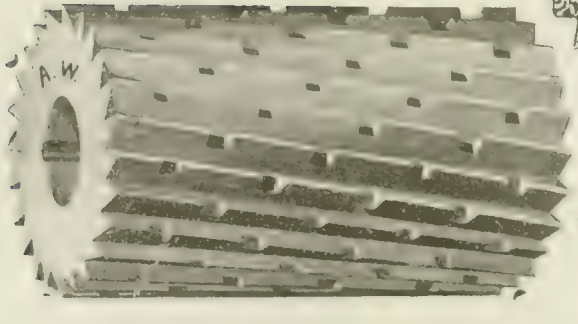
ARMSTRON

Works:—
Longueuil, Que.

CANADIA

Messrs. Sir W. G. Armstrong Whitworth & C
Ltd. Engla

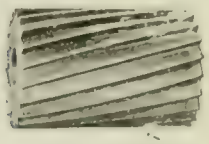
Messrs. Armstrong & Main Ltd.
Constructional Engineers, Glasg



WHI

ARMSTRONG

TRADE MARK



TOOLS

Milling Cutters
Drills, etc., etc.

We combine **scientific methods** with an **intimate knowledge of working conditions. Result—Accuracy and Endurance,** which have led machinists to insist on **"A.W." Tools.**

on Every Tool

WHITWORTH *of* Canada Limited

Head Office:
298 St. James St., Montreal

Branches:
Toronto, Winnipeg

REPRESENTATIVES FOR

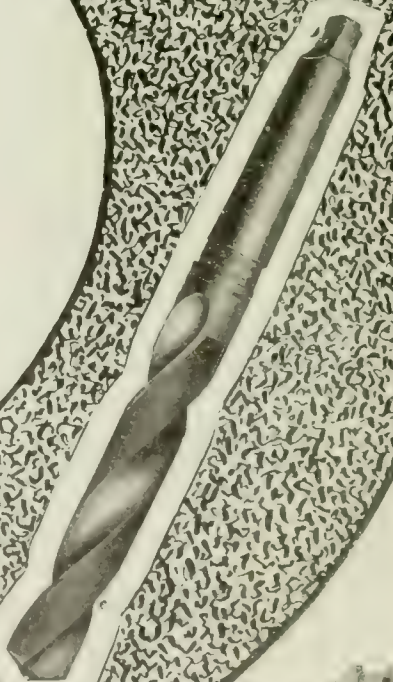
Messrs. Cromptons Ltd.
Electrical Engineers, London

Messrs. Armstrong Siddeley
Motor Cars, Coventry

Messrs. Rylands Ltd.
Wire Rope Manufacturers
Warrington

Messrs. Partington Iron & Steel Works
Manchester

Messrs. Pearson & Knowles Ltd.
Steel & Iron Manufacturers, Warrington



WORTH

than one produced by carbon monoxide (CO); but the highly poisonous character of the substance has been a serious objection to its use, and the tendency is to wastefully lead the gas to the stack and out of harm's way, instead of controlling it to get maximum efficiency.

To case-harden steel and iron alloy articles in a stream of cyanogen gas evolved from a container filled with an alkali cyanide salt, heated by electrical energy or other means to accomplish vaporization or boiling of the salt, is the principle upon which the new process is based. The articles or materials to be processed are independently heated out of contact with the fused cyanide salt. The advantage of this will readily be appreciated on recalling the statements made regarding the fact that case-hardening is produced by contact with gaseous and not with solid carbon, and more especially with cyanogen gas. The depth of penetration is then only a function of the uniformity of the temperature of the article treated and the duration of treatment. Nascent cyanogen gas has a speed of penetration of four or five times that of carbon monoxide.

The furnace shown in the sketch embodies the regenerative principle, since the excess gases not absorbed by the steel are forced under pressure into the fused cyanide bath, are reheated, causing a vigorous stirring of the bath and a lively evolution of cyanogen gas. The gas is thus produced with more energy and in larger quantities, and it more vigorously attacks the surface of the steel, thus causing an accelerated and deeper penetration.

Regenerative Type of Furnace

This regenerative type of furnace is a means of using the rather expensive salt economically, as the nitrogen gas on returning to the bath will combine with the sodium, and a carbon supply in some cheap form such as charcoal can be added to the liquid as required, thereby retaining the original amount of cyanide salt intact. It is, therefore, obvious that this process may compete with the present box or packing carburizing processes.

To prevent the poisonous gases, which are under pressure, it should be recalled, from escaping into the room, the suction fan is shut down before the charging door is opened, a bell ventilating device for inducing draft is arranged so as to open the bell when the fan stops and prior to opening the door. The speed of the pump or blower is to be regulated so as to cause the desired degree of circulation. Parts of the pump or suction fan wherever possible should be of non-ferrous metals, such as copper basic alloys or hard copper. Water cooling jackets or other protective methods are to be employed for the return flues containing hot gases, and the nozzle end of the flue must be of hard copper, monel metal or other non-ferrous alloy with a high melting point.

Sodium cyanide melts at 600 deg. C. (1,112 deg. F.) and boils at 800 deg. C. (1,472 deg. F.). The temperature of the pot must therefore be not less than 800 deg. C., and to effectively absorb the gas the steel is at a temperature above AC_3, or about 900 deg. C. (1,650 deg. F.).

The furnace illustrated in the sketch is designed especially for the processing of shafts, but a slight modification of the upper or steel heating chamber will adapt it to a variety of work. Grates of nichrome metal with knife-edge grate bars for supporting the work can be employed.

The advantages of this process are the following:

1. Temperature control is more perfect, since a pyrometer is inserted directly in the heating chamber;

2. It gives a finer, more uniform, and deeper case than any other process and requires less time, and is therefore cheaper;

3. It eliminates the use and storage of carburizers and carburizing boxes.

The efficiency of cyanogen gas for case hardening has never been fully appreciated, nor has it been fully obtained, since during previous tests the temperature was at or below the boiling point of sodium cyanogen (1,465 deg. F.), which is considerably below the AC_3 point of the steel. But, even in this unfavorable condition an exceptionally high speed of penetration has been noted by different writers on the subject.

It should be noted that, while some of the less important features of this process are still speculative in character because of the experimental stage of the development, the method is based upon well known principles and the conclusions have been drawn from a careful study of general case-hardening practice.

SECURING PROPER LUBRICATION

Sluggish action of oil-rings leading to improper lubrication of motor bearings was cured by bevelling the sides of the rings of motors made in a large New Jersey factory after considerable searching for the reason for the trouble. On testing these motors, says Electrical World, it was noticed that the ring would creep along at a very slow speed, two or three revolutions a minute on a machine of several horse-power, instead of the regular speed of about thirty to fifty revolutions. Though all journals and rings were made in large numbers and as nearly alike as possible, this trouble appeared on only about one machine out of ten, and disappeared nearly every time a new ring of the same size and shape was put in. Sometimes, of course, it was due to the ring rubbing against some projection on the casting, but more often no apparent cause was found by the assembling department. At that time the oil-rings were cut from a rather heavy brass tube with straight sides, making the cross-section rectangular in shape, while the journals had a straight slot about twenty to twenty-five mils wider than the ring.

It was finally discovered that under certain conditions the ring would start with the machine and perhaps come up to normal speed, but soon work itself towards one side of the slot and slow down, hugging closer and closer until there was only a very thin film of oil between the ring and the flat part of the journal.

Therefore, in an attempt to prevent sticking, three rings were removed and their sides were slightly bevelled, when the trouble entirely disappeared. Since that time all oil-rings are bevelled either from the outside or from the inside, and there has been no sticking.

PLAY SAFE

In climbing a ladder, do you ever pause to think "Am I safe"? Instead of pausing, partly up the ladder, why not investigate before you leave the ground? Watch the angle at which it rests. Seventy-five degrees has been found to give the greatest degree of safety, and to secure this angle all that is necessary is to place the foot of the ladder a distance approximating one-quarter of the length of the ladder away from the vertical. This angle will prevent undue straining of the ladder or slipping of the ladder feet when placed too flat and at the same time will give the feet of the workmen sufficient room when they are working near the top of the ladder. Another point that should not be forgotten is that portable ladders should be fitted with safety feet or points in order that a sure grip on the floor or ground may be secured.

POWER FROM WASTE WOOD

The progress which has been made by British firms in the construction of suction gas plants for utilizing waste wood should be of special interest to this country, where there are still large quantities of wood available. These plants distil the wood and produce gas which is of excellent quality for use in gas engines. This method of utilization is said to be more economical for power producing purposes than burning under a boiler. A recent example of a large installation on these lines is afforded by a mine in a British Dominion, where four suction gas plants capable of yielding a total output of fourteen hundred horse-power have been installed. The fuel used is in the form of logs up to two feet long and a foot in diameter; and the gas is applied to the driving of four horizontal gas engines. Three of the engines drive electric generators and the fourth is coupled to an air compressor for operating pneumatic drills and hammers in the mine.

Have You Tried This Contest Yet? If not--- Do so Now

Below will be found twelve references to advertisements in this number. To the sender of the first correct set of answers to these we will forward one of these scales.
To win one is not difficult, and at the same time you will add to your store of knowledge. Read the details given below.

The scale is 6 in. long and is made from finest quality steel. One side is marked in 32nds, the other side in 64ths. A table of decimal equivalents is also stamped on one side, and a table of tap drill sizes on the reverse side. This scale is well worth securing.

What You Have to Do

We publish every week a number of interesting facts or statements selected from the advertising pages for that week. The selections for this issue are given below. Read these through, then turn to the advertising section and see if you can pick out the advertisements to which they refer. The work is interesting, it will train your powers of perception and of memory, it costs you nothing, it will make you better acquainted with the various lines of machinery and tools in the market, and with perseverance you are bound to win one of these useful scales as a prize.

Nine contestants solved the twelve questions in Feb. 10th issue correctly. This meant we had to use the elimination method once more. A visitor who was in our office was asked to pick on one of the papers, all of which were face downward. John McNaughton, Westville, N.S., was the lucky one, while the others who came so near the prize were: Mr. Baird, Windsor, Ont.; Albert Hepworth, Philadelphia; Geo. A. Todd Penetanguishene, Ont.; G. Overton, London, Ont.; W. Smith, New Liskeard, Ont.; W. S. Miners, Sarnia, Ont.; H. G. Zimmer, Waterloo, Ont.; and John A. Scarsbrook, Winnipeg, Man.

CONTEST FOR MARCH 3RD ISSUE

Contestants are required to write us, stating to which advertisements we refer in this number.

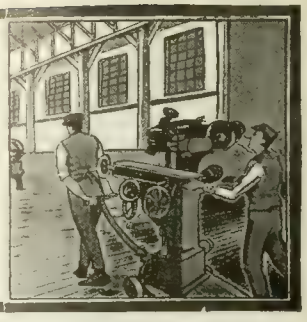
1—How to prevent weariness and discontent.
2—What one concern says you should consider if you want to increase production and quality.
3—Something that makes the engineer speak up.
4—Something that should be thrown away after a certain time.
5—How to get furnaces and fuel to suit your conditions.
6—Something that takes its power from an ordinary lamp socket.
7—How to handle work that requires heat, with a high degree of efficiency.
8—How to conserve oil.
9—How to secure volume production.
10—A good piece of advice in regard to money.
11—Something that costs little for upkeep.
12—Something worth considering and which will save you money.

These are Correct Answers for List from February 10th Issue:

1—L. S. Starrett Co.
2—The Carlyle Johnson Machine Co.
3—The Kearney & Trecker Co.
4—The J. G. Blount Co.
5—Thos. Firth & Sons, Ltd.
6—Murchey Machine & Tool Co.
7—Roelofson Machine & Tool Co., Ltd.
8—Cleveland Pneumatic Tool Co. of Canada, Ltd.
9—Geo. D. Roper Corporation.
10—The Bilton Machine Tool Co.
11—McKenzie Bros.
12—The Gisholt Machine Co.

Closing Date for This Contest is March 24th.

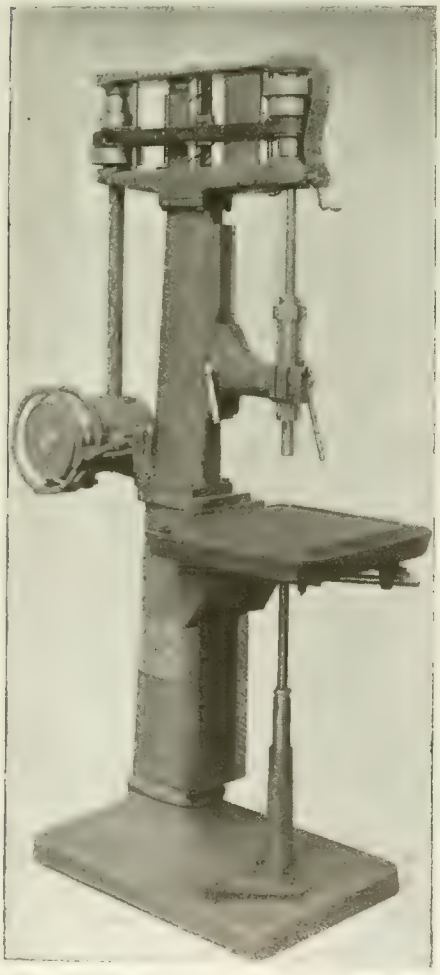
DEVELOPMENTS IN SHOP EQUIPMENT



BALL BEARING DRILLS

The Providence Engineering Corporation, Providence, R.I., have placed on the market the line of ball bearing drill presses formerly known as the Mason drilling machines. They are now to be known as the Pecorp machine.

These machines are equipped with ball bearings throughout, and range from the small bench type up to the heavier style shown in the illustration. The spindle is self-oiling, is made from tough spindle steel, and has a reservoir in the sleeve that contains sufficient oil to lubricate the spindle for a week. Various other features are included, and the complete range of speeds is said to be obtainable in less than two seconds. Unit construction of parts is followed out throughout the construction of the machine.



GENERAL VIEW OF BALL BEARING DRILL PRESS.

Various arrangements can be made on these machines. They can be made as a plain machine, a single speed purpose machine, and automatic power feeds can be arranged on any spindle alternating with built-in tapping attachments. Motor drive of both horizontal or vertical style can be supplied if required.

NEW TAPER COLLAPSING TAP

The Alfred Herbert, Ltd., Coventry, England, have developed a new taper collapsing tap, and have the following to say upon the subject.

The problem of cutting internal taper threads in pipe couplings and similar work has always been a difficult one. Tapping with a solid taper is an unsatisfactory and primitive method of doing the work, as the whole length of the cutting edges is in operation at the same time, so that a very large amount of power is required to drive the work. Moreover, a number of lines are left in the work where the tap ceases cutting, which makes it difficult to get a good joint.

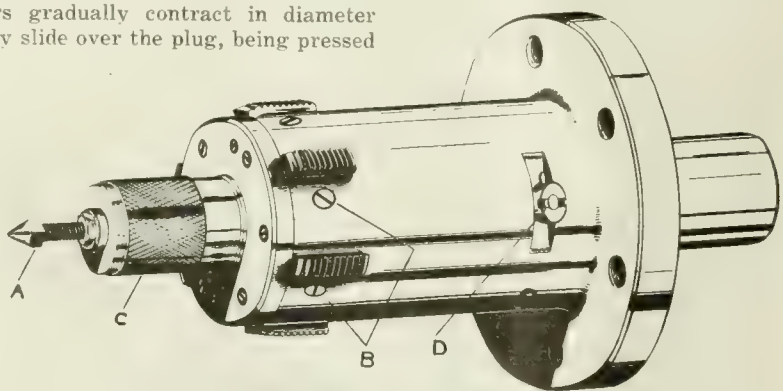
The chasers in this tap are supported on a taper plug, the front end of which projects through and is fitted with an adjustable screw A as shown in illustration. This, during tapping, is brought to rest by coming into contact with a suitable abutment inside the work. The chasers gradually contract in diameter as they slide over the plug, being pressed down on to the taper plug by compression spring B engaging pockets in the chasers, and retained by screws so that cutting takes place only on the cone or lead of the chasers, consequently no more power is required than when tapping parallel threads of the same dimensions.

By adjusting the screw A in or out the diameter of the thread can be adjusted within an appreciable range. At the end of the travel the chasers collapse an amount greater than the depth of the thread so that the tap can be withdrawn without reversing the work. By rotating the knurled sleeve C in the right-hand direction, the chasers are raised by a scroll, whereupon the plug shoots out into the starting position ready for the next piece.

In the illustration, the plug is shown at the right-hand end of the travel, i.e., with the chasers fully collapsed. Where a fine degree of accuracy is required a roughing and finishing attachment D can be supplied so that two cuts can be taken on the work without disturbing the adjustment. The design of this roughing and finishing attachment is similar to that used in the parallel type, style H Coventry collapsing tap.

The tap shown was made for taper pipe couplings 5 inches diameter for use on a screwing machine. It was, therefore, made with a flange to bolt to the screwing machine spindle. These taps can be made for taper threads 1½-inch gas and upwards, and are at present made to special order to suit the machine on which they are used, and for the work for which they are intended.

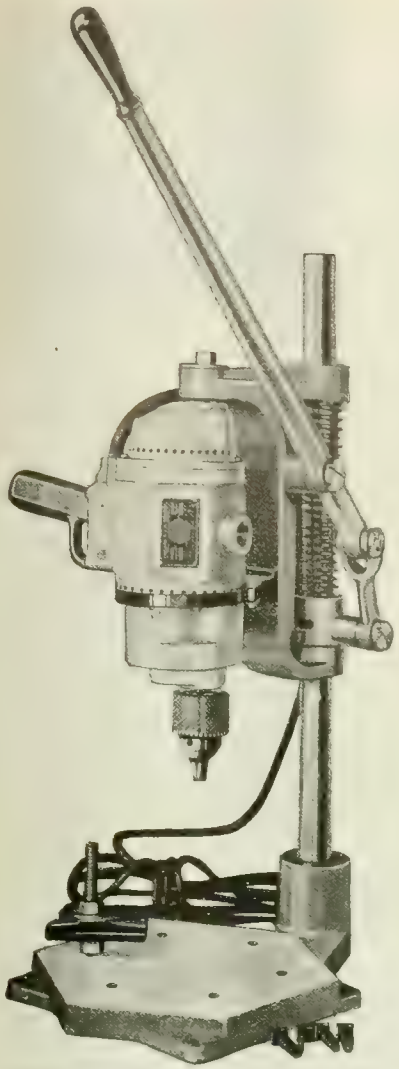
The Canadian office, 1-3 Jarvis Street, Toronto, are, of course, handling this tap in Canada.



DETAIL VIEW OF THE COLLAPSING TAP

BENCH DRILLING STAND

The Black & Decker Mfg. Co., Baltimore, Md., have placed on the market a bench drilling stand as shown in the illustration. This takes ⅜ in., ½ in., 9-16 in., ⅝ in., and ⅞ in. B. & D. portable drills. The bracket carrying the drill can be raised or lowered on the vertical column and is secured in any position by means of a split collar and clamping screw. The drill may be



GENERAL VIEW OF BENCH DRILLING STAND

swung clear of the base, making it possible to use this stand for such work as applying ring gears to automobile axles, drilling in the ends of shafts, and other work too high to be drilled on the bench. The feed lever gives a feed ratio of 6 to 1.

This concern have also marketed a portable automatic tank outfit, operated by an electric compressor. This blowing outfit, as it is termed, is especially adapted to the blowing away of dust, lint, etc., from motors and machinery in general. It is, of course, used for other purposes such as inflating pneumatic tires, etc., but its chief interest to the machine tool trade is its cleaning qualities, in so far as machinery is concerned.

CYLINDER GRINDING MACHINE

The Heald Machine Co., Worcester, Mass., have placed on the market a cylinder grinder known as their No. 55 style. This machine does away with speed boxes and other expensive units, replacing them with a drive from a single shaft on the rear of machine. It is also self contained, no countershaft being necessary. Naturally, this makes the machine less expensive.

The table is large enough to hold cylinder blocks of six cylinders without large overhang, even when grinding the end holes. The grinding spindle is carried on top of the column in a cylindrical, rotating head made up of two eccentric sleeves, this giving an adjustment to provide for grinding different sizes of holes. The spindle has two speeds, obtained by means of a two-step cone on the main drive shaft. The large, adjustable knee shown in illustration carries the main table, which slides back and forth in a line parallel to the spindle. The ways are protected from grit and dirt, and oil pockets with rolls are provided for continuous lubrication. The travel of the main table automatically reverses, adjustable dogs being provided to allow of controlling the limits of travel. Two speeds can be obtained by means of a knob placed at the front of the machine, and the cross-slide is provided with a hand feed screw fitted with a graduated dial.

The wheel spindle is hardened and ground, and runs in a solid, tapered bronze bearing at the wheel end, with a self-aligning ball bearing at the pulley end. It is fitted with interchangeable pulleys, to give different speeds to the grinding wheels, so that the proper speed for the size of wheel used can be obtained. The depth of cut is controlled by the feed mechanism on the right-hand end of the rotating head. It can be operated either by the knob for small adjustments, or by a small crank on the shaft below the knob when large adjustments are to be made, as when going from one size of hole to another.

Wheel spindles can be furnished to suit work of different types, the type depending upon the diameter and length of hole to be ground. Pump, tank, fan and diamond mounting can be furnished if required.

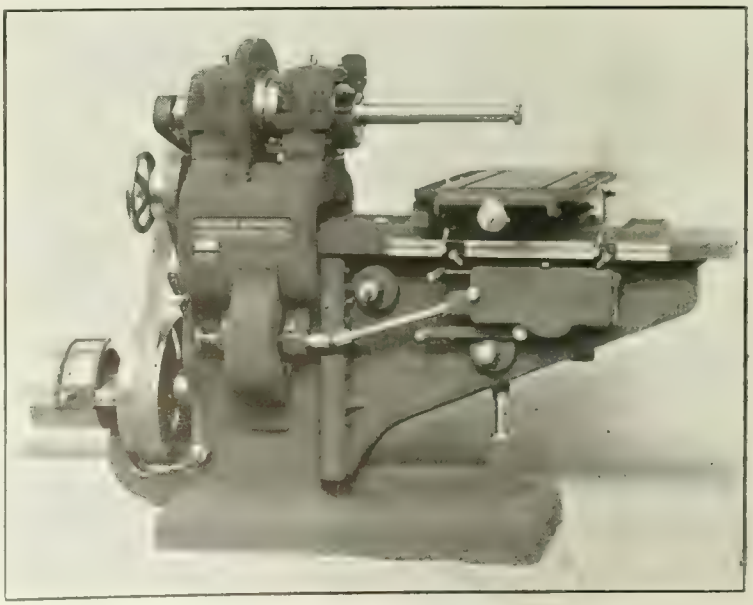
AUTOMATIC LATHE

The Rockford Machine Tool Company, of Rockford, Ill., have added an automatic lathe to their line of machine tools. This machine is intended for the rapid production of duplicate parts, such as the turning of pulleys, pistons, gear blanks, etc., where various operations can be carried on simultaneously. It is designed along the lines of their heavy duty lathe and constructed to withstand the severest service. The headstock is cast integral with the bed so as to eliminate slippage. The front or turning head is carried on a 3-inch bar supported in both the front and the rear head. The carriage is supported on the outer end on a hardened way that can be shaped to give the work a taper, convex or concave surfaces. The back or facing head is carried on a bracket on the back of the machine. The movement of the back head is obtained by means of a cam drum operated by rack and pinion. Cams of any desired shape may be mounted on this drum. The machine is supplied with an oil pump for supplying lubricant to the work and cutting tools. The machine can be supplied with a belt or motor drive.

K. T. TOOLS

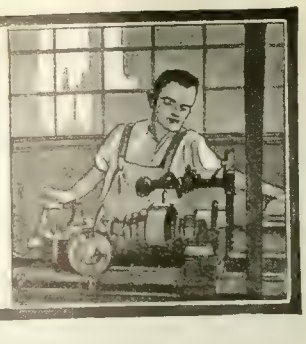
The Knanel Tool Works, Rock Island, Ill., have placed on the market their line of tools. These include their adjustable taper caliper and high-speed parallel clamps. The caliper is fitted with a lock which sets the members to any taper desired and allows for duplication. They range from No. 1 to No. 10 B. & S. taper shanks.

The clamps are made of steel throughout and are heat treated to secure proper strength. They are claimed to be absolutely parallel and are said to grip powerfully.



GENERAL VIEW OF THE GRINDER.

WHAT OUR READERS THINK AND DO



MAKING TIME ON A SQUARE THREAD CUTTING JOB

By D. A. Hampson

A SHOP that manufactures (manufactures, not makes) square threaded lead screws and screws for jacks and other such purposes has adopted the accompanying fixtures as their standard practice in threading. Precision screws are not turned out, though all of their screws must pass a test with a twelve-inch steel rule—and the commercial accuracy of the product is so high that the rejections from faulty lead are practically nil.

All the threading lathes in the shop are equipped with the same tools, i.e., there are two sizes of cross slide castings—one for larger and one for smaller screws—and each of these sizes takes the cutter blades of a certain range of widths. This standardizing of tools keeps down the initial expense and minimizes the cost of repairs.

Reference to the drawing shows the customary cross slide bearing a tool block on its upper face. Then there is a rear casting A that fits the cross slide ways and is adjusted to any desired position before tightening the gib screws. In addition to this latter fastening, two bolts B are supplied. This makes a rigid fixture, one well calculated to stand the lifting action of the rear cut. Casting A is planed to receive a slide S, having square ways and a slot on top for the tool, or cutter.

The rod R, adjustable from the front of the lathe, joins the carriage with the link at the rear of A—and it is the function of this link to move the rear tool into the blank screw just as the front tool is moved in for a cut by the operator's turning the crank handle, the movements of both tools taking place at the same time and being of equal amount. At the end of the cut, when one tool is withdrawn for reversal or whatever other means is followed for returning the carriage, the other tool backs out clear of the work as well.

This outfit turns a "mean job" into the production class. The two cuts balance and so avoid that curse of square threading—a buckling screw—which occurs in spite of the rests used. With this rig, no rests are required and two cuts are made at once; it is hard to say whether more time is saved by setting up or in actual cutting. Flooded lubrication is employed.

Turning a Twelve-inch Crank Shaft

Nothing remarkable disclosed by that heading. The shaft, however, weighed three tons and was not removed from its bearings. Up at the cold storage plant, their oldest ice machine had had a loose balance wheel for years; finally it got so bad they couldn't keep a key in it and arrangements were made to exchange the wheel for a new one—but we were asked to turn the shaft to remove the irregularity caused by years of pounding—turn it straight and send a snap gauge of its diameter to the engine builder.

We had a 20″ planer whose cross-rail was easily detached and this we planned to use for turning. The cross rail would bridge the flywheel pit easily and could be secured near enough to the worn shaft to leave the tool rigid; two brackets to support the cross rail were cast and these were fastened by having a lug on each bracket extend over the caps of adjacent main bearings. When drilled and held down by these main bearing bolts, our rig was complete.

Twelve hours were consumed at the plant—and we had eighteen inches of good straight shaft to show for it. As against any other method, the cost of this was less than the trucking charges for moving the shaft if it was taken out. The scheme of using a planer head for a portable tool is an old one with engine men, but it is always new to others in the craft.

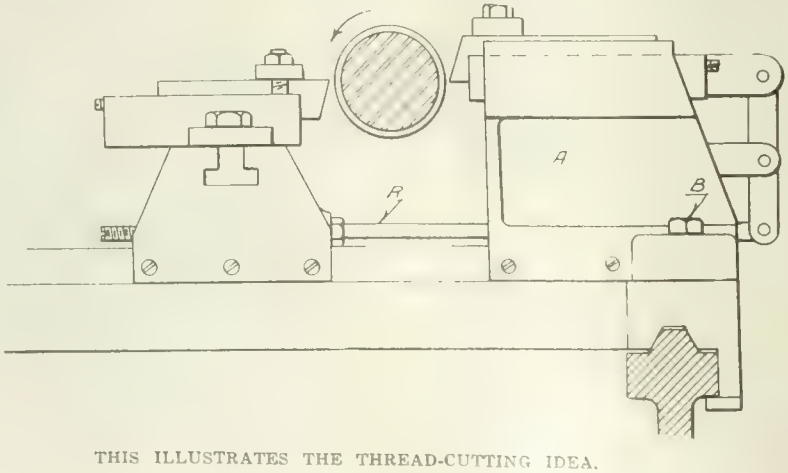
REDUCING COSTS IN HIGH SPEED TOOL SERVICE IN MACHINE SHOPS

By P. Dyson

During twenty years' practical experience as a mechanical engineer, a great deal of which time has been spent in machine shops both in Great Britain and Canada, I have often been led to wonder, when seeing expensive and still good machines scrapped, and still more costly machines bought to replace them, how comparatively few shops there are that know the comparative production of each machine as judged by actual working. In other words, whether the heavy costs of installing new machinery are always justified when contrasted with the production given by the machines scrapped. To me it seems as if the new machine is set to work, an operator found for it, and there it ends as far as comparisons go with former production.

The object of this short article is to point out, after careful observation, one of the causes of a machine not coming up to expectations on an output basis. I am referring more particularly to the method of supplying high speed tools to the machinists. I will try to illustrate more clearly what I mean by relating what proved to be a very interesting experience some little time ago.

I was employed in the machine shop of the locomotive works of one of the largest railways in Great Britain. A large proportion of the machines had recently been scrapped and replaced by the finest products of British and American machine tool makers and the shop superintendent was determined that the



THIS ILLUSTRATES THE THREAD-CUTTING IDEA.

service of high speed tools to the machinists must be worthy of the machines on which they were to be used. He also decided that no machine should be stopped through a machinist going to the toolsmith or grinding wheel with his tools, and at the same time decided to take away existing grindstones and emery wheels from the shop.

It was given to me to institute a new system of supply which would give satisfaction to masters and men alike. I set out by making myself familiar with the class of work done in all the lathes and on the turning and boring mills, slotters, planers, shapers, autos and borers through out the shop. I next made it my business to get hold of all the available high speed steel in the shop and it was amazing to see the huge pile I collected in the form of broken and damaged tools which were lying in cupboards and under machines. My new toolroom consisted of a high speed furnace together with high pressure blower and pyrometer, whale oil tank, and water tank. The grinding plant consisted of two Lumsden oscillating tool grinders each with a Norton conical grinding wheel and one ordinary disc grinder with table inclined at 6 degrees and racks containing an aperture for every one of the above mentioned machines.

The tools were standardized and a chart drawn out giving the cutting and clearance angles of every tool. Some of the tools were forged, while with others, it was found advantageous to grind them into shape. The rough grinding was done dry on one machine. They were then hardened and re-ground wet on the other machine and the radius finished off on the disc grinder, the inclined table at 6 degrees giving the necessary front clearance angle. Tools were then placed in the aperture in the rack which was labelled with the number and name of the machine to which they belonged and when the system got into full swing it was found possible for every machinist to have a good set of tools by him and at the same time have at least one duplicate set in his aperture in the toolroom rack.

When a machinist had tools that required regrinding he sent them to the toolroom and duplicates were given to the messenger. The others were attended to by the men on the Lumsden grinders and replaced in the rack.

This system was found to be economical and highly satisfactory. The tool steel was worked out to very small proportions. When a 1½-inch square section tool had become too short for use it would be drawn down to a smaller section, and then a smaller section again, and would eventually finish its career by being used up ¼-inch square section for turning copper fire-box stays in an automatic machine. This does not damage the steel in any way, it only requires care on the part of the blacksmith that he does not put it under the hammer at too low a heat.

During the time I was engaged in collecting the old style tools from the machinists it was very amusing to hear the remarks from some of the older hands. One man who had turned piston-rods for the past twenty-five years declared that nobody could grind a tool to do that job except himself. His principal tool was a right-hand sliding tool and when he was first given one of the new products of the Lumsden grinder he put it down with the remark, "No good." However, the last I heard of him was that he had increased his production of piston rods.

From my experience in Canada, I am convinced that the above method could be adopted with great advantage in a number of machine shops over here and I have been led to relate the above experience in the hope that it may help towards this end. That the workmen would gladly co-operate goes without saying, for they know full well that increased production is better for everyone concerned.

SPECIAL LAMP

The supremacy of the carbon arc lamp in the projector field is being challenged by a special bulb lamp invented by a British firm in which the light is supplied by an electric arc between two small beads of tungsten. An intense point of light is thus obtained. Larger lamps are made with a square plate of tungsten (about half a square inch in area) which becomes white all over and produces a light of as much as four thousand candlepower. Smaller sizes give five hundred and one thousand candle power. For cinema projectors and many other purposes these new lamps are said to have many advantages over the old-fashioned carbon arc. They can be run off any electrical circuit, whether continuous or alternating.

CIRCULAR SLIDE RULE

In order to assist engineers to calculate the size of pulleys and width of belts for transmission problems, a British firm has developed a circular slide rule by which all the details required can be ascertained with rapidity and accuracy.

In the German city of Hamburg a taxi may be called by dropping a coin into a slot machine. If this idea were in force here we might run out of coppers, judging from the amount of taxis flying around.

LEADING ARTICLES IN THIS ISSUE

New Universal Plate Mill at Hamilton 65
Technical Details, Construction Work, and Electrical Equipment.

Increasing Production With Turret Lathe .. 69
Machining a Gear, a Clutch, and a Series of Collars —Tool and Time Study Sheets.

Operating Railroads Under War Conditions 73
Actual Experiences, Locomotives Used, How Absence of Power Brakes Was Overcome.

A New Method of Case-hardening Steel.... 77
Factors Governing Case Hardening, Present Methods in Use, How to Secure Greater Uniformity and Depth.

Making Time on Square Threading Job ... 84
Simple Fixture to Increase Work—Turning a Twelve-inch Crankshaft—How to Prevent Tap Breakage.

Pouring Twenty Tons of Iron a Minute 87
Toronto Shop is Now Working on Largest Dynamo in the World, and Some Castings Are of Unusual Interest.

Reducing Costs in High-speed Tools 83
Steel Costs Money, and Any Scheme Whereby We Can Save Money is Always Welcome—Valuable Hints Are Given.

Merry Little Price War in Toronto 88
Steel Merchants Are After Business, And If Prices Stand in the Way Then the Price Must Move—The Same Is Going on in Montreal Warehouses.

Where is the Steel Market Going? 89
Pittsburg Letter Tells of Many Price Changes and Intimates That Corporation Is Down to About 65% Capacity Now.

Machine Tool Builders in Cleveland 96
National Association Gathered and Discussed Many Things—Some Announcement May Be Made Later on Regarding Price Policies of the Makers.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

THURSDAY, MARCH 3rd, 1921
VOL. XXV NUMBER 9

Published in the Interests of the Machinery, Manufacturing, Iron, Steel, and Metal Working Industries.

B. G. NEWTON, Manager
A. R. KENNEDY, Managing Editor
J. H. MOORE, Technical Editor
T. H. FENNER, Associate Editor
J. H. RODGERS, Resident Editor, Montreal

SUBSCRIPTION RATE

Canada, $4.00, United States $4.50, Great Britain, Australia and other countries 15s per year, other countries, $5.00. Single copies 25c. Advertising rates on request.

THE MACLEAN PUBLISHING COMPANY, LIMITED
143 UNIVERSITY AVENUE
TORONTO, CANADA

JOHN BAYNE MACLEAN, President
H. T. Hunter, Vice Pres. H. V. Tyrrell, Gen. Mgr.

The Need of Information

SEVERAL strikes are pending, others have taken place, and it looks as though much of the metal working world would be involved in troubles over the readjustment of wages to meet changed and changing conditions.

It is hard to ask a man to meet a reduction in wages and it is hard for a man to accept a cut. As soon as he comes into higher wages the chances are that the standard of living in the home comes up to a higher level. There may be a few homes where this would not hold good, but in the majority of cases it would work out that way.

When it comes to the point where readjustment has to be made, there is only one way of taking the keen edge off of a wage reduction and that is by being able to show to an employee that there have been corresponding reductions in the prices of things he must purchase.

The trouble is that this information is hard to secure. The figures used by the Labor Department at Ottawa are not practicable enough. They do not meet the needs of every community. In this country we have no organization that is going into this work as thoroughly as the Industrial Conference Board in United States, the findings of which can be accepted as readily by an employer as by an employee.

In order to deal justly with this condition, there is need right now in Canada for a statistical organization doing work on the plan followed by such firms as the International Harvester at Hamilton. When they desire information as to how much it costs a family of five to live, they work it out in actual every-day practice, making the purchases from the average stores and under average conditions. It has been found possible in this way to arrive at something that will be satisfactory to all concerned, because the men in the shop know it is right and the management have faith in the results.

Many a firm is faced right now with the necessity of making a reduction of wages because present conditions do not warrant the old rate. They will likely make a direct cut of so much all around and the chances are that the amount will be arrived at by trying to figure out how much they can afford or how much they think the men will stand.

We need better organization along these lines in Canada.

The composite market average is a quick way to get an idea of prices. This represents the average of fourteen iron and steel products. Over a period of seven years they stand: To-day, $47.10; February 16, 1921, $48.36; January, 1921, $51.73; November, 1920, $63.75; February, 1920, $65.63; February, 1914, $23.52. If you want to know at once how things stand as compared to a year ago, there it is $47.10 as against $65.63, or a drop of $18.53.

Apprentice and Superintendent

THE superintendent of a large shop signed an order for added equipment a few days ago. He had not been interviewed by any machine tool salesman. He knew exactly what he wanted and he knew the firm he was going to place the business with. But let this man tell his own story:

"Years ago as an apprentice I learned to love machine tools and one of the happiest moments of my life was when, on odd days, I could get inside a machine tool showroom and spend hours going over the new designs that were coming out. One day I was in a certain city and went in one of the showrooms to have one of my treats. A salesman came along and asked what I wanted. Upon telling him he informed me that it was a salesroom and not a showroom. I didn't go home, but went to another place, hoping for better luck. I had not gone very far into that place when I was met by a different sort of salesman. He showed me around and we had a good time together. He made me feel at home and he told me certain things about new lines that impressed me. I was not a superintendent then—simply an apprentice."

There is not a salesman in the business who cannot benefit by that incident. The idea of impressing an apprentice and winning the buying power of a superintendent may not impress you very much, but it is none the less a fact.

It does not require the outlay of much courtesy and attention to make a friend. Being courteous to a non-buying apprentice and winning a superintendent with big purchasing powers is a real, worth-while piece of business.

Price tendencies were down this week in several steel markets. The law of supply and demand is at work and greater than that is the desire of a good many steel merchants to clear out their stock. There was more steel held in the country than was generally believed. In a rising market such as prevailed for about a year and a half, terminating six months ago, it is easy to sell, and about nine out of every ten buyers do things they wouldn't do in normal times. The liquidation of high-cost stocks is very advisable, even if accomplished at a loss.

There is a marked difference in the coal market now as compared with conditions six months ago. Coal Age this week uses such words as "marking time," "demoralized," "standstill," "glutted," in describing conditions, especially in the soft coal trade. This condition developed very rapidly following the falling off in industry—so quickly, in fact, that one is led to wonder if some of the stories of coal shortage, when demand is good, can stand on all fours.

Pouring 50 Tons in Less Than 3 Minutes

"WELL, it looks as though it was all over and all right." Such was the modest acknowledgment of our congratulations to the superintendent of the foundry at the Allis-Chalmers Co., Toronto, a few days ago.

Our time-piece had just told us that it had taken exactly fifteen seconds less than three minutes to pour fifty tons of iron into the biggest casting ever made in Canada. That is, one ton went in every three seconds, or pretty close to it. And this casting forms the base for the biggest dynamo ever made in the world. So you can see that in this Dominion of ours, in spite of its lean streaks and its agitators, and those who claim we shouldn't do anything but grow grain here, there are firms forging ahead and doing some worth-while big things.

Making a casting that size is like excavating for a fair-sized house. A glance at the photo on this page will give some idea of the size of the mold. The layman thinks of the molder as ramming away with some sand and cores, all on a fairly small scale. He seldom stops to think that he is called upon to build the place in which 50 tons of hot iron are going to be poured at the rate of about 20 tons per minute—that there must be reinforcements and bindings and safety margins to take care of all the pressure that tremendous weight is going to exert—that the gas that is going to come into existence must be let out and burned.

THIS SHOWS THE SIZE OF THE MOLD, SETTING CORES, ETC. IT IS 26 FEET ACROSS AND SOME 80 FEET AROUND.

And just to make sure that everything was going to stay just as planned, "Jimmy" Craig, the superintendent of the foundry, had piled an extra hundred tons of weights on top just to make sure that nothing went through the roof. The placing of that added weight was simply a precautionary measure. The fact that it was sitting on top of that heap may have had quite a bit to do with said heap behaving itself, for as Mr. Sedgwick, the general superintendent of the plant, explained, "There is really no way to know definitely how much resistance is required to play safe on a job of that size."

There were, for instance, some eighteen bolts 2¼" across and 6' 3" long, holding top and bottom. These were all turned down tight and in themselves out to stand a strain of 300 tons each or 5,400 tons in all. The breaking strain would easily be five or six times as much as the safe working strength.

It Was Well Done

A person can hardly help admiring anything that is well done. A greenhorn could have gone into the Allis-Chalmers foundry last Friday afternoon and after watching the final preparation for the pouring of that casting and the completion of the work, he would have seen one thing standing out all over the place, viz., organization. There was nothing left to chance. They were not wondering at the last minute if this thing or that had been done. All HAD been done.

One ladle was good for some 30 or 35 tons of metal. There's something mightily impressive in the way the men who live up near the roof in the cranes run their 'bus up and down the shop and drop those ladles where they are wanted almost to the inch. The iron was taken out in ten-ton lots—poured and covered with charcoal to keep out the air. Then in an hour or so the cupola was ready to belch out another allotment of ten tons. And so it took a good five hours' blowing and puffing for those two ladles, one with 30 and another 20 tons to be ready for the last act in making the base for the dynamo that is going to be sent across to the Chippawa power development.

They Take No Chances

But hold a minute. They're not taking any chances. We climbed the winding staircase to where the cupola was being stuffed—stuffed to the neck on this occasion after those two ladles were filled. Pig, scrap and charcoal was the diet for the day and the chalk marks on the stack indicated the number of helpings of each that had been dished to the big stove that day. "We're not taking chances to-day," said the cupola foreman, "it's no use for the sake of a few tons to risk running short. And so it was that the extra 10 tons was spouted out and the work started on pouring.

Every man Jack of them knew what to do. No person yelled—no person was excited, nor was there any evidence of that abundant "Now all together boys" meddler. It was so still that I heard someone across the shop say, "There she goes" when the first iron hit the pouring basin. Pouring was done from opposite ends, the iron running around in a ditch, with many holes.

Pretty soon the gas started to blow where it had been lit. "She's starting to fill up now," remarked one old foundry man, "and she's all right, too. It's queer how we get used to work like that. I mind not long ago pouring one in Buffalo. It was the first one of that size, some forty or fifty tons. They had the ambulance and fire brigade all tuned up for the occasion. But nothing happened. But believe me, we always feel a bit better when we see a baby like that poured and done for."

Walking the eighty feet around the outside of that mold a few minutes after it was poured, when its stomach and liver and everything else was grumbling and pouring out smoke, gas and heat, one would hardly stop to think about the cooling-off process. In fact it would be very easy to imagine, as the gas was blazing away at the top and forcing its way out of the ground two or three feet distant from the base, and with that mass left in the ditch on top, that it would never get cool again. But even as we squinted at a respectable distance, the superintendent had given orders to start tearing the house down by midnight. That hundred tons excess baggage that was camping on the neck of that iron baby was taken off. Then a certain number of bindings, bolts and strapping had to

Continued on page 100

MARKET DEVELOPMENTS

More Readjustments are Made in Prices

Local Dealers Give a Lower Figure on Sheets and Plate—Orders For Bar Mill Material Are Eagerly Sought—What Pittsburgh Has to Say About Prices and Conditions

SOME of the warehouses in the steel business continue to mark down prices. Sheets came down farther this week and are at a point they have not touched in the last two or three years. Still the price cutting has not improved the sale and very few are moving. One firm placed an order for well over a car of bar iron this week for stock purposes, believing that the price and service they secured on the order were good enough to warrant them taking on the material. Some reinforcing bars are being sold and other work is under way that will call for a good tonnage of this sort. Dealers all over are out to sell now, in an effort to get their stocks cleared out.

Many stories are heard in the street as to how long the U.S. Steel Corporation will stand by and see the independent operators cut away at their prices and stop the flow of business to their mills. One report says that so many of the large agricultural implement makers have taken on stock at present prices that should the Corporation come along with a cut now it would seriously involve these interests.

Some of the largest makers of machine tools have come along with announcements during the week of reductions in their selling schedule. These vary from 15 to 20 per cent. There is no thought that the new price will stimulate buying, but it is simply an effort of the builders to try and line up with other reductions. Long years of experience have taught the machine tool market that price reductions do not make sales. Machine tools are bought for a purpose and not because they are cheap.

The scrap metal markets are dull yet. Dealers have too much copper on hand, some of the yards being badly clogged with this metal. Any prices quoted now are more or less nominal. Yards as a general thing are not carrying much heavy melting and stove plate and it would not take much added activity to make this class of material much in demand at better prices than are going now. Dealers claim it does not pay to collect and sort this at present values. There is no money being made in the scrap metal business just now and it is probably a fact that the majority of the yards are losing every day they keep open for business.

MONTREAL BUYERS ARE STILL IN THE MOOD TO BUY FOR ACTUAL NEED

Special to CANADIAN MACHINERY.

MONTREAL, March 3.—When are we to have a return of that confidence in business that insures a steady movement of all lines of commodities? Upon this question hinges the duration of the present period of trade depression. The solution of the trade problem is—to buy. So long as buying is restricted or even curtailed, just so long will dullness prevail. Every line of industry is more or less affected by the non-buying attitude, a factor that tends to unemployment and underproduction, and consequently high prices. The metal situation is the key to all other activities; therefore, it is essential that this market be stabilized before a return to normal can be attained. Reports from every quarter point to the continued attitude of conservative buying.

Steel Dull and Unsettled

Steel conditions in this district reflect the unsettlement that prevails both in this market and that existing in the States. Dealers here state that they do not know where they are at. This is the result of the action of many mills, particularly those on the independent list in the States, of quoting prices considerably below the market, and as one dealer remarked: "They are not justified in taking such a stand, as these prices are very often much below what it costs to produce the material." However, it seems to be a question of "getting the orders" and if lower prices will effect this, then quote it. This may seem like a reasonable attitude, but it has the tendency to augment the uncertainty that has pervaded the market for many weeks past. "Consumers are not buying," said the dealer, "except for actual needs. If a suggestion is made that material will probably be needed for spring and summer requirements, the reply is invariably along the lines of 'the future will take care of itself.' Railroad buying is almost exclusively for repair work; material for new construction is practically nil. Shipyards are taking very little. Orders for single plates are now more common than tonnage placements."

Despite the continued dullness, however, there is still the old optimism that improvement will come soon. True, there appears little to substantiate such claims, but this belief of better business is an encouraging factor. A steel dealer here stated that more orders were received last Saturday than on any previous day for several weeks, and the greater number were of the urgent variety. "Our experience," he stated, "confirms us in the belief that very many consumers in every line of activity are carrying on with as small a surplus as possible, covering only when necessity requires, content even to hold up production while waiting on delivery. This attitude is one that prevents a speedy return to normal business, but at the same time proves that the needs of industry are such that business would be rapidly accelerated should anything like normal activity be resumed on short notice." The movement of boiler tubes, while light, is quite active when compared to the sales of other lines. There has been a recent reduction on tubes, these declines averaging about 5 per cent., the greatest reductions being on the lap-welded tubes; 1 3-4 inch l.w. are now $27.50, and 4 inch are $55.50. Two

inch seamless are quoted at $29.25, a decline on previous prices of 5 3-4 cents per foot. Sheets and plates are very quiet, with prices unsteady.

Dealers Seek Information

"Well," said one scrap dealer, "the present is a trying period, and one requires to have considerable faith to keep his office open. We are now carrying on business at a loss and anticipate this condition for some time to come. None the less, our expectations are for a gradual return to greater activity. Sufficient trading is maintained to keep us interested, but receipts are low—very low. We are pretty well stocked, but are reluctant to seek a market at prices that would mean a heavy loss to us. We are not seeking material for the same reason. Until the market is more active we will assume a passive attitude. The prices quoted may as well stand as they are, although weakness may develop."

A FEW STOCK ORDERS PLACED

Buyers Believe Present is a Good Time to Place Business—Some Prices Down.

TORONTO.—There is some evidence here and there of business coming in for machine tool houses, for iron and steel merchants, but it is still pretty well scattered, and buying is done only after very close scrutiny. One dealer expressed a view that probably sums up the ideas of a good many in the business: "The present market is making more hard buyers than ever existed before. They seem to know that we want business, and that we are inclined to get right down on the mat and pull off the best terms possible. It is spreading, too. We have firms on our books whose business we have simply received as a matter of course for years. Only this week we got a letter from them asking for quotations on several items that in the ordinary course of trading they would have turned over to us without a thought about the price they would be paying."

Prices remain pretty much where they have been in the machine tool market. The belief seems to be held that there will be no move to put machine tools any place near the pre-war price. Some of them have not gone up as far as others. One warehouse was showing a shaper this week and the question arose regarding the comparative price of that machine to-day compared with pre-war times, when the dealer stated: "It used to sell at the factory for $405, but to-day the price, with exchange and 27½ per cent. duty added, makes the tool worth about $1,200."

This same dealer held that it was not desirable that prices should come down to old figures—in fact, he held that it was impossible.

Small tools are being sold in pretty much the same way. Orders are quite numerous, but they are small, although one hears of a few orders being placed for stock by some of the larger users. This market has also felt the work of the man who wishes to cancel his order. One firm had a number of special drills made, and they were of such shape and design that were they to go back to the maker they would have to remain on his shelves waiting for some other queer demand to come along and take them out, the chances very much inclined to them remaining indefinitely. Failure to cancel the order has cost the dealer his chances of getting any more business from that source.

[illegible] all lines of small tools, and the indications seem to point to them remaining there for some little time to come, although there is a willingness on the part of some of the offices to pare a little on a good-sized order. The National Railroads have some specifications out yet that have not been placed.

The Steel Market

Whether the dealers admit the fact or not, there is a merry little war going on now when any fair-sized order is let loose in the steel market. Dealers are anxious to get cleared out of stock. They feel that they are going to buy to better advantage later on—in fact, they can buy now much better than they could a few months ago. So if a chance comes along to make a good hole in the stock they are carrying they are going to cut their earnings pretty close in order to make the hole in the stock.

There is a certain amount of material going out now for building operations, although it is a little early to sell much reinforcing steel. Some Government work has been allotted and bars were required for that. Other large work is under way, and some pretty good-sized tonnage is certain to result.

The warehouse generally relies on the small machine shop to send in a certain amount of business in bars, but just now this trade is not coming in, and orders are short to that extent.

Tube prices in this district remain where they have stood for some months back. In fact, tubes are still at the same price they were a year ago.

Placing a Stock Order

That thing most rare for a long time past has started to show up in the market again, viz., the good old stock order. Yes, he is in our midst, but is a little wobbly yet. Still, it is regarded as a good omen that he is venturing out. One firm that has a good-sized machine for doing its own work bought a large car lot during the week, and took the material home at a pretty close price. It's a buyer's market all right, and some of the buyers are beginning to take notice of the fact that this situation is not going to do them much good unless they go ahead and take advantage of it.

Sheets are very quiet now. They have been marked down again to keep them lined up with other classes. Black 28 are quoted at 6.50, and that is probably the lowest price since the last days of 1917. There was no warehouse price that could be counted on absolutely in 1918-19, while for the most part during 1920 it was a case of buy where you can get served and find out about the price afterward.

Plate is moving out decidedly slowly. One mining company came in a short time ago with an order that put at least one warehouse all right as far as its stock is concerned.

At another office the report was that inquiries were improving, if anything, and that several car lots were being

POINTS IN WEEK'S MARKETING NOTES

Reductions were made this week in the prices of sheets and plate in Toronto warehouses. Sheets are at a lower price now than they have been since early in 1917.

Several of the large makers of machine tools have sent out announcements of reductions in their selling schedules. These will amount to between 15 and 20 per cent.

One large order for bars was placed this week for stock. The buyer in this case decided that the price he received, together with the good delivery, warranted him in laying in his requirements out of the present market.

The scrap metal market continues about the same as it has been for the past five or six months. There is every reason to believe that dealers are quite correct when they claim they are losing money every day they are in business on the present market.

There are not very large supplies of heavy milling steel for stove plate in any of the scrap yards now, and there should be a pretty fair demand for these later on. Dealers claim that it does not pay them to collect and sort this class of material at present prices.

Small tool dealers report only a fair amount of business coming in, and this is made up largely of small orders.

Pittsburgh reports that the United States Steel Corporation is now operating at about 65 per cent. capacity, and that next week will see this figure still lower.

placed. There was, in the opinion of this office, a better buying tendency than there has been since the first of the year.

The Scrap Metal Trouble

There's very little joy to be found in the scrap metal market this week, or any week for a long time past. "The longer we keep open the more we lose," was the view of one pessimist this morning, but one never expects to find much visible joy in the scrap metal market. The copper surplus in United States markets continues to increase. A week or so ago the producers got a loan of $40,000,000, placing as security against that 400,000,000 pounds of copper. "Electrolytic is quoted this morning," remarked a dealer, "at 12.75, but I know very well that it can be bought for 12.50 if one were to get out and buy. The market has got out of the hands of the producers, or the dealers, or the buyers themselves, for that matter. It is any person's affair just now, and there does not seem to be any step that would stabilize it."

There is a fair demand for heavy melting and stove plate, but the price is so low, claim the yards, that it would not pay them to have men collect and sort it. Yards are for the most part pretty well cleaned out of iron and steel. Were they as barren of coppers they would be in much better shape than carrying, as they are, large stocks of this metal.

MORE CHANGES IN TOOL PRICES

Some of the Big Makers Are Out Now With Cuts of From 15 To 20 Per Cent.

Special to CANADIAN MACHINERY.

NEW YORK, March 3.—The meeting of the National Machine Tool Builders' Association in Cleveland last week was devoted mostly to a discussion of the cost of doing business in the industry. The executive committee of the association presented a uniform cost finding method, which has been devised by a firm of accountants, Scovell, Wellington & Co., Boston, Mass., after careful investigation throughout the trade.

The machine-tool trade is of the opinion that interesting developments in the price situation may be expected shortly. At the Cleveland meeting it was announced that two of the leading machine-tool builders, the Brown & Sharpe Manufacturing Co. and the Cincinnati Milling Machine Co. had reduced prices 15 per cent. Reduced prices are now in effect on nearly all well-known makes of grinders, shapers, engine lathes and precision lathes. In some instances manufacturers have not formally reduced their prices, but in competition have met the cuts of their competitors.

Developments in the market so far as business is concerned are very meager. Domestic business is almost at a standstill, although occasional orders for single machines are being placed. In foreign trade the principal buying is from Japan and India.

A BIG BUYER IN THE MARKET MIGHT SET A NEW LOW PRICE

Special to CANADIAN MACHINERY.

PITTSBURG, March 3.—The finished steel market continues stagnant. There is scarcely any inquiry and thus the mills cannot get much business and do not even have much opportunity to endeavor to get business by making further price cuts. The position of most independent mills is that they would gladly quote lower prices than have yet been named if thereby they could secure reasonable sized orders and by the term they do not mean really large orders, but rather orders for say 1,000 tons at a time in the heavy rolled products and even less in the lighter materials, like sheets.

Declines in prices in the week have been small. Plates, which were quotable a week ago at about 2.25c as minimum, against the Industrial Board and Steel Corporation price of 2.65c, have been quoted at 2.10c, and the producing interest which quotes this price will not say how small a tonnage need be offered to induce it to quote it, while intimating that on a really large inquiry a still lower figure would be named. Shapes are quotable at 2.25c, the same as a week ago, the old price having been 2.45c, but the lack of a lower price on shapes seems to be due simply to there having been no inquiry to bring out a lower quotation. Bars were quotable a week ago at 2.00c, the old figure having been 2.35c, and may still be quoted generally at 2.00c, though it is known that in some special cases 1.95c and even 1.90c has been quoted, while in some quarters it is believed 1.85c could be done if there were the right sort of inquiry.

In sheets there are definitely lower prices. Blue annealed sheets are still quotable at 3.20c against the Industrial Board price of 3.55c, but the 3.20c is practically nominal, awaiting inquiry, and the heavy gauges can be bought at much less, as they could be bought at a plate mill price, say at 2.10c plus an extra for their being under ¼-inch thick. Black sheets can easily be done at 4.10c, against 4.15c quoted a week ago, and an Industrial Board price of 4.35c, while it is believed 4.00c could be done and perhaps shaded a trifle on a really good order. Galvanized sheets have been quoted even in small lots at 5.25c against 5.35c a week ago and an Industrial Board price of 5.70c.

Standard steel pipe seems still to present a firm front, so far as the mills are concerned, but it is reported that some jobbers, particularly in the East, are offering to sell at mill prices. Tin plate likewise has not been shaded. These two are the only lines that remain at Industrial Board prices.

The Steel Corporation has made no reductions, but adheres rigidly to the Industrial Board prices, just as it did all through the period when the independents were readily securing much higher prices.

Buyers Apathetic

The record of prices and price declines, however, is of little significance and of no particular interest. As to market conditions it does not matter what prices chance to be quotable, as there is no market in the sense of there being activity. It would make very little difference in the year's earnings of producers or consumers whether the material now being sold were at $10 a ton higher or $10 a ton lower than the prices that are just now quotable as the market.

Buyers are taking no interest in prices. There is nothing like a deadlock. Buyers are not waiting for lower prices, nor have they any particular prices in mind, at which they would be disposed to buy.

The really interesting feature of the situation is the relation between the Steel Corporation and the independents, which was referred to at some length in last letter. The independents evidently wanted to force the Steel Corporation to reduce wages, but the corporation refuses to take action. The independents did not, presumably, wish to force the corporation to reduce its prices, though obviously the corporation must eventually do so. Apparently they did wish to curtail the flow of steel from the Steel Corporation to its customers, as the existence of this steel, much of it going into stocks, would tend to detract from the quantity the independents would be able to sell later.

Last Friday a circumstantial report emanated from Youngstown to the effect that the Steel Corporation was to have a meeting that day and the next of the sales managers of the subsidiary companies, to consider making price reductions. The newspaper reports quoted officials of the Steel Corporation in Youngstown without giving names, also a prominent independent steel official, name also not mentioned, all commenting on this meeting, yet there was no meeting. The sales managers who would constitute the meeting were to be found at their desks in Pittsburg both days. The presumption is the report was conceived by independent steel men rather than by newspaper men. From various circumstances it is plain that the steel industry is not entering an era of good feeling between the various producers.

Operations

The Steel Corporation could not logically reduce its prices when it still had a high operating rate, based on old orders, but the cutting by independents has caused many customers of the corporation to instruct that shipments be curtailed or discontinued, and the cor-

poration operations are decreasing rapidly. They were about 75 per cent. of capacity week before last, against about 92 per cent. in the first fortnight of the year, and last week they probably did not average over 65 per cent. This week will naturally show a still lower rate, and so on. The decline paves the way for the corporation to reduce its prices, and, of course, the corporation will reduce wages when it reduces prices or soon afterwards.

Practically everywhere it is admitted that the independents are operating at under 25 per cent., and one observer with good facilities for ascertaining the facts estimates that the rate is under 20 per cent. In other words, the independents are not running as well as when they started to cut prices, although they might be no better off if they had not cut prices. The one noteworthy result of the price cutting is the great decrease in the Steel Corporation's operations.

Foundry pig iron has quietly slid off a dollar a ton, $27, valley, being now the accepted market price, Bessemer remaining at $27 and basic at $25. These prices are more or less nominal, and certainly they are not supported by any buying to speak of. The prices are much below the cost of production, based on the cost of the large quantities of ore the furnaces have, purchased at last season's prices, and recent prices for coke. It appears now that the pig iron price will make the ore and coke prices, rather than the other way, and of course furnaces have to absorb the loss on the ore already bought. There is no interest in coke as to actual purchases, and little interest as to the future, the point about coke being that eventually the Steel Corporation will no doubt reduce wages all around, including wages in the Connellsville region, and then the other operators in the region can reduce also. When the new wage scale is in force it will be possible to figure how cheaply coke can be sold. The market is nominal just now, with spot furnace at $4.50 and contracts at $5.00. Some operators ask more, of course, but even those with the lowest prices do not effect sales. Spot foundry coke is quotable at $5.50 to $6.50, depending on brand, all prices being per net ton, f.o.b. Connellsville ovens.

Pig Iron Market

The general tendency in the pig iron market is still downward. Some rumors of very low prices have not been confirmed, but their influence has had a depressing effect on the market. The reduction last week in the Pittsburg district of standard basic iron to $25 by a merchant interest has not resulted in any appreciable increase in demand. One company in this district has disposed of some off basic at $24.50, furnace, part of the tonnage going to a Homestead melter, the price in this case being equal to about $24 valley furnace basis. Basic is being quoted at $25, and No. 2 foundry at $27.

Chicago reports that business has been very light during the past week. Although it is possible that better prices can be obtained no orders have appeared to bring out such quotations. Delivered at consumers' yards—southern foundry, sil., 1.75 to 2.25, is being quoted at $34.17, and basic at $28 to $29.

The Birmingham iron market seems to have steadied itself since the establishment of the $27.50 level, and none lower had been heard from up to the close of the week. One furnace interest booked about 1,500 tons of iron during the week at $27.50 to $30, much of the $30 business being acceptance on quotations previously made. The leading interest continues to ignore the general market. Although the indications have been brighter, indications seem to point to a stronger effort to hammer the market down to $25.

The volume of business on the books and in prospect in the Buffalo district is so small that it has been remarked by one sales manager that he has not seen such stagnation in the iron trade in 30 years. Increased business was expected on account of the heavy inquiry two weeks ago, but this has not been realized. Reports are current of furnace iron sold at less than $30, but verification is lacking. No. 2 plain, 1.75 to 2.25 silicon, is quoted at $28 to $30, and basic, nominal, at $30.

On the St. Louis market foundries are doing a little work and are taking an occasional carload, but this is about all the business being carried on.

The market at Cleveland shows little life. Lake furnace prices on foundry iron have declined $1 a ton to $28, at which several small lot sales have been made. An inquiry has been made for 1,000 tons of foundry iron for prompt shipment by the American Radiator Co., for its Detroit and Titusville, Pa., plants, also an inquiry for 1,000 tons for second quarter, but it is understood the latter inquiry was sent out to obtain prices for use in quoting on castings. There is a considerable amount of resale foundry iron in the market and it is being offered from $1 to $2 a ton below the prices asked by furnaces.

The New York market is still extremely dull, with indications of further weakening. A sale was made of 1,000 tons of foundry grades last week at a price that is understood to be equivalent to about $27 eastern Pennsylvania for No. 2 plain, and less than $25, Buffalo, but no sales of Buffalo are reported at less than $28.

That buyers are a little more confident as regards the present quotations on the Philadelphia market is shown by a few more sales of 500 and 1,000 ton lots. One eastern furnace took a 1,000 ton order for February-March shipment at $29, base furnace, and a 500 ton order at the same price for the same delivery.

Scrap Metal Market

The scrap metal market is still lifeless and prices continue to show weakness, though dealers believe the bottom has been reached.

Chicago reports that if the market could be any duller than it has been for some time past, that is the condition during the past week. Except for tonnages bought to apply on unfilled contracts for the Gary plant, dealers have practically no outlet for their material, and shipments to that destination have been almost enough to cover its requirements. As a result dealers are again accumulating scrap in their yards. Quotations on many grades have been lowered 50 cents to $1 per ton during the past few days. Heavy melting steel remains at $15 to $15.50. Railroad offerings are not as plentiful as has been the case.

Owing to the necessity for small dealers to raise cash, an increasing number of sales of scrap were made during the week on the Boston market. The larger dealers, without exception, are buying all tonnage that appears at concessions. The foundry demand in New England continues slack. No. 1 machinery sold during the week at $23 delivered. The price of railroad wrought, based on several recent sales, has advanced from $15 to $15.50.

The heavy snowfalls in New York have brought operations in the New York district to almost a standstill. Prices have been unchanged, although some weakness is reflected in cast scrap, of which there seems to be an unusually large supply at this time.

At Philadelphia dealers are inclined to refuse bids on large tonnages of scrap offered at the current prices. A couple of mills inquired for heavy melting steel at $14 and $14.50, but were told that large lots could not be had at these prices. However, it is not certain whether or not the mills would have bought even if they could at these prices. Small lots of heavy steel continue to sell at $14.50 delivered.

On the Pittsburg market No. 1 cupola cast is quoted at $22 to $23. Some demand is current for heavy breakable cast, but there seems to be a considerable shortage. Recent small sales of cast iron borings and shovel turnings have been made around $12.50. Prices have been reduced as follows: Cast iron borings, from $12 to $13 to $11.50 and $12.50; shovel turnings, from $12 and $13 to $12 and $12.50.

Buffalo reports an extremely dull market. Mills figure that the bottom has not been reached, but indications point that it has, and many dealers are speculating on this. It is believed that few dealers would care to sell large tonnages at $15.

The market for scrap continues quiet at St. Louis.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON

Grey forge, Pittsburgh	$26 00
Lake Superior, charcoal, Chicago.	40 50
Standard low phos., Philadelphia.	41 50
Bessemer, Pittsburgh	28 96
Basic, Valley furnace	26 00
Toronto price:—	
Silicon, 2.25% to 2.75%	39 25

IRON AND STEEL

Per lb. to Large Buyers	Cents
Iron bars, base, Toronto	$ 4 50
Steel bars, base, Toronto	4 50
Iron bars, base, Montreal	4 25
Steel bars, base, Montreal	4 25
Reinforcing bars, base	4 50
Steel hoops	6 00
Tire steel	5 00
Spring steel	8 00
Band steel, No. 10 gauge and 3-16 in. base	5 50
Chequered floor plate 3-16 and heavier	7 50
Bessemer rails, heavy, at mill	2 35
Steel bars, Pittsburgh	3 00-4 00
Tank plates, Pittsburgh	3 50
Structural shapes, Pittsburgh	2 45
Steel hoops, Pittsburgh	3 05
F.O.B., Toronto Warehouse	
Small shapes	4 50
F.O.B. Chicago Warehouse	
Steel bars	3 48
Structural shapes	3 58
Plates	3 78
Small shapes under 3-in.	3 48

FREIGHT RATES

Per 100 Pounds.

Pittsburgh to Following Points	C.L.	L.C.L.
Montreal	58½	73
St. John, N.B.	84½	106½
Halifax	86	108
Toronto	38	54
Guelph	38	54
London	38	54
Windsor	35	50½

METALS

	Gross. Montreal	Toronto
Lake copper	$18 50	$17 50
Electric copper	18 00	17 50
Castings, copper	17 75	18 00
Tin	39 00	40 00
Spelter	7 75	7 50
Lead	6 75	7 50
Antimony	8 00	8 25
Aluminum	34 50	30 00

Prices per 100 lbs.

PLATES

Plates, 3-16 in.	$5 25	$5 25
Plates, ¼ up	4 75	4 75

PIPE—WROUGHT

Standard Buttweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
⅛	$ 6 50	$ 8 50	$.....	$.....
¼	5 31	7 41	5 91	8 01
⅜	5 31	7 41	5 91	8 01
½	7 10	8 63	7 95	9 48
¾	8 80	10 87	9 95	12 02
1	13 01	16 07	14 71	17 77
1¼	17 60	21 74	19 90	24 04
1½	21 04	25 99	23 79	27 84
2	28 31	34 97	32 01	38 67
2½	44 75	55 28	....	....
3	58 52	72 29	....	....
3½	74 06	90 62	....	....
4	87 75	107 37	....	....

Standard Lapweld Pipe

Per 100 Ft.

	Steel Blk.	Steel Galv.	Gen. Wrought Iron Blk.	Gen. Wrought Iron Galv.
2	$32 01	$ 38 67	$35 71	$42 37
2½	48 26	58 79	54 11	64 64
3	63 11	76 88	70 76	84 53
3½	75 90	92 46	85 10	101 66
4	89 93	107 55	100 83	120 45
4½	1 05	1 29	1 30	1 54
5	1 22	1 50	1 52	1 80
6	1 58	1 95	1 97	2 33
7	2 06	2 53	2 53	3 01
8L	2 16	2 66	2 66	3 16
8	2 49	3 07	3 07	3 64
9	2 98	3 67	3 67	4 36
10L	2 77	3 41	3 41	4 05
10	3 56	4 39	4 39	5 21

Prices—Ontario, Quebec and Maritime Provinces

WROUGHT NIPPLES

4-in. and under, 50 per cent.

4½-in. and larger, 40 per cent.

4-in. and under, running thread, 20%.

Standard couplings, 4-in. and under, 20%

Dd., 4½-in. and larger, net.

OLD MATERIAL

Dealers' Average Buying Prices

Per 100 Pounds.

	Montreal	Toronto
Copper, light	$10 50	$ 9 00
Copper, crucible	13 00	11 00
Copper, heavy	12 00	11 00
Copper wire	12 00	11 00
No. 1 machine composition	13 00	9 75
New brass cuttings	7 00	8 00
Red brass turnings	8 00	8 00
Yellow brass turnings	7 00	6 00
Light brass	5 00	5 00
Medium brass	6 50	6 00
Scrap zinc	5 00	4 00
Heavy lead	4 50	4 00
Tea lead	2 50	2 00
Aluminum	15 00	10 00

	Per Ton	Gross
Boiler plate	$11 00	$12 00
Heavy melting steel	15 00	14 00
Axles (wrought iron)	25 00	20 00
Rails (scrap)	15 00	14 00
Malleable scrap	20 00	20 00
No. 1 machine cast iron	30 00	25 00
Pipe, wrought	8 50	8 00
Car wheel	30 00	25 00
Steel axles	20 00	18 00
Mach. shop turnings	8 00	6 00
Stove plate	23 00	20 00
Cast boring	8 00	7 00

BOLTS, NUTS AND SCREWS

	Per Cent
Carriage bolts, 7-16 and up	Net list
Carriage bolts, ⅜" and less	15
Coach and lag screws	—20
Stove bolts	55
Wrought washers	—25
Elevator bolts	Net
Machine bolts, 7-16 and over	—5
Machine bolts, ⅜-in. and less	—30
Blank bolts	Net
Bolt ends	—5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil. hd., steel	+25
Machine screws, fl. and rd. hd., brass	Net
Machine screws, o. and fil. hd., brass	Net
Nuts, square, blank	+25 add $2 00
Nuts, square, tapped	add 2 25
Nuts, hex., blank	add 2 25
Nuts, hex., tapped	add 2 75
Copper rivets and burrs, list less.	27½
Burrs only, list plus	10
Iron rivets and burrs	37½ and 5
Boiler rivets, base ¾" and larger	$8 50
Structural rivets, as above	8 40
Wood screws, O. & R., bright	67½
Wood screws, flat, bright	67½
Wood screws, flat, brass	55
Wood screws, O. & R., brass	55½
Wood screws, flat, bronze	50
Wood screws, O. & R., bronze	47½

MILLED PRODUCTS

(Prices on unbroken packages)

	Per Cent
Set screws	Less 40%
Square and hexagon head cap screws	Less 30%
Round head cap screws	Plus 10%
Fillister head cap screws	Less 10%
Flat head cap screws	Net list
Button head cap screws	Plus 10%
Studs	Less 20%
Semi-finished nuts up to and including 1-in.	Less 35%
Semi-finished nuts 1⅛ to 1½"	Less 30%
Semi-finished nuts 1⅝ to 2 in.	Net list
Coupling bolts	Plus 10%
Taper pins	Less 40%
Planer bolts without fillet	Plus 40%
Planer bolts with fillet	Pus 50%
Patch bolts	Plus 80%
Hollow set screws	Plus 20%
Thumb screws	Less 35%
Thumb nuts	Less 65%

BILLETS

F.O.B. Pittsburgh.

	Per gross ton
Bessemer billets	$43 50
Open-hearth billets	43 50
O.H. sheet bars	47 00
Forging billets	48 50
Wire rods	57 00

NAILS AND SPIKES

Wire nails, base	$5 10
Cut nails, base	5 75
Miscellaneous wire nails	50%

ROPE AND PACKING

Plumbers' oakum, per lb.	0 10¼
Packing, square braided	0 38
Packing, No. 1 Italian	0 44
Packing, No. 2 Italian	0 36
Pure Manila rope	0 26
British Manila rope	0 20
New Zealand hemp	0 20

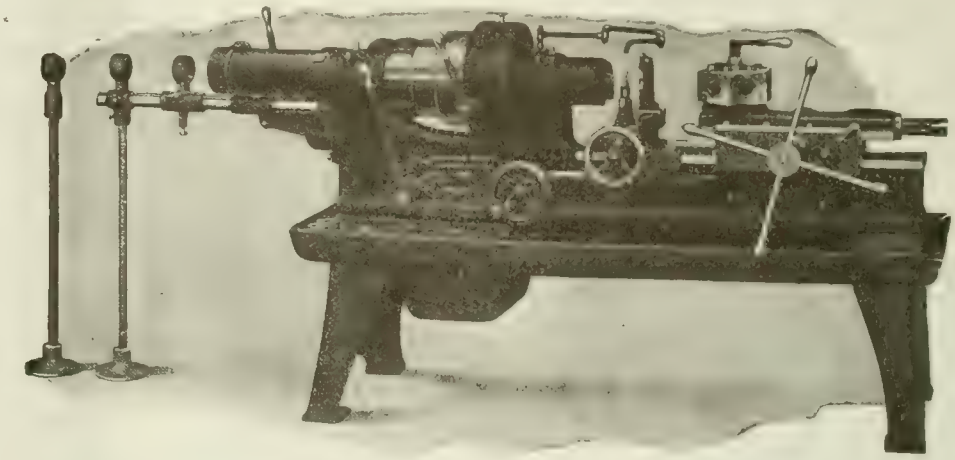
POLISHED DRILL ROD

Discount off list, Montreal and Toronto	Net

Warner & Swasey Screw Machines

For large output and close limits—If you are figuring on screw machine work you can depend on W. & S. machines being right for the job.

We can supply you from stock immediately.



The A. R. Williams Machinery Company, Limited

ST. JOHN, N.B.
WINNIPEG, VANCOUVER

If It's Machinery—Write "Williams"

64 Front Street West
TORONTO

GERMAN GOODS ARE FINDING THEIR WAY TO CANADIAN MARKET

The menace to Canadian industry from Germany appears to be not only real, but immediate, according to the Canadian Reconstruction Association, and while Germany is making a moan about her ruined industries, she is at the same time trying by every means in her power to regain the position in the world's trade she occupied before she plunged the world into war. The United States Department of Commerce has reports from Argentina showing how the Teuton is underselling American firms, a concrete instance being in the respective quotations for 10,000 car wheels. In Mexico, German manufacturers are offering hardware at 25 per cent. lower than U.S. firms. The low exchange situation, to some extent, explains the matter, but high exchange countries like Canada and the United States are menaced by countries whose currency is greatly depreciated in international trade.

Perfect Industrial Machine

In a recent statement, a British government official said that "Germany is still a perfect industrial machine, running at low speed, it is true, but undamaged as yet in its vital parts, and would respond readily to any stimulus. The Guaranty Trust Company, of New York, which has just issued an analysis of "German plans to extend foreign trade," written by the assistant manager of its international trade department, quotes this statement:

"German exports for the first five months of 1920 were valued at 23,688,000 marks as compared with 10,057,000 marks for the entire year of 1919. For the eleven months ending November, 1920, the United States imported from Germany imports valued at $84,000,000, as compared with $10,608,141 for the entire year of 1919."

German imports into Canada for the eight months period ended November 30, 1920, were valued at $725,322, as compared with a value of $11,862 for the corresponding period of 1919.

German salesmen in great numbers are at work in all parts of the world offering low prices and long credits, with quicker deliveries than their rivals. Before the end of last year English warehouses were filled with German toys, which, with the exception of dolls, were generally at about the same price as toys of British manufacture.

American railroads are said to need 12,000,000 tons of rails to restore them to pre-war condition. This tonnage, representing a deficit, must be supplied over and above the normal consumption.

STEEL EXPERT DIES AFTER OPERATION

C. E. Duncan, General Superintendent of Algoma, Was Sick Only a Few Days

Sault Ste. Marie, Ont.—C. E. Duncan, general superintendent of the Algoma Steel Corporation, died here following an operation for appendicitis. He had been ill only a few days. Mr. Duncan was forty-eight years of age and was born in Chattanooga, Tenn. He learned the steel business in the Homestead works of the Carnegie Steel Corporation, where he mastered every branch of the trade. Throughout Canada and the United States he became recognized as an authority. He first joined the Algoma Steel Corporation in 1909 as general superintendent and worked in that capacity until 1915 when he entered the service of the United States Government as adviser in large plants. When the late David Kyle died here last spring Mr. Duncan succeeded him as general superintendent of the Soo mills. Mr. Duncan's death is deeply regretted by his business associates, for his death means the loss of an exceptionally brilliant and successful steel man. The remains will be taken to Johnstown, Penn., for interment.

MISCELLANEOUS

Solder, strictly	$ 0 27½
Solder, guaranteed	0 29½
Soldering coppers, lb.	0 62½
White lead, pure, cwt.	17 00
Red dry lead, 100-lb. kegs, per cwt.	15 00
Gasoline, per gal., bulk	0 42
Pure turp., single bbls., gal.	1 20
Linseed oil, raw, single bbls.	1 00
Linseed oil, boiled, single bbls.	1 03
Wood alcohol, per gal.	2 75
Whiting, plain, per 100 lbs.	3 00

CARBON DRILLS AND REAMERS

S.S. drills, wire size	40 and 5
Can. carbon cutters, plus	10
Standard drills, all sizes	40 and 5
3-fluted drills, plus	10
Jobbers' and letter sizes	40 and 5
Bit stock	50
Ratchet drills	10
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	50
Sleeves	50
Taper pin reamers	25 off
Drills and countersinks	Net
Bridge reamers, carbon	50
Centre reamers	5
Chucking reamers	Net
Hand reamers	10
High speed drills, list net to plus	20
Can. high speed cutters, net to plus	10
American	plus 40

COLD ROLLED STEEL

[At Warehouse]

Rounds and squares	$7.00 base
Hexagons and flats	7.00 base

IRON PIPE FITTINGS

	Black	Galv.
Class A	60	75
Class B	26	36
Class C	17	26

Cast iron fittings, 5%; malleable bushings, 22½%; cast bushings, 22½%; unions, 37½%; plugs, 20% off list.

SHEETS

	Montreal	Toronto
Sheets, black, No. 28	$ 7 30	$ 6 50
Sheets, blue ann., No. 10	6 25	6 00
Canada plates, dull, 52 sheets	13 00	13 00
Can. plates, all bright	14 00	.....
Apollo brand, 10¾ oz., galvanized	....	.....
Queen's Head, 28 B.W.G.	12 50	....
Fleur-de-Lis, 28 B.W.G.	11 50	....
Gorbal's Best, No. 28	....	.....
Colborne Crown, No. 28.	....	.....
Premier, No. 28, U.S.	10 00	9 00
Premier, 10¾-oz.	10 50	9 40
Zinc sheets	15 50	20 00

PROOF COIL CHAIN

(Warehouse Price)

B

¼ in., $13; 5-16, $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.20; ¾ in., $9.30; ⅞ in., $9.50; 1 in., $9.10; Extra for B.B. Chain, $1.20; Extra for B.B.B. Chain, $1.80.

ELECTRIC WELD COIL CHAIN B.B.

⅛ in., $16.75; 3-16 in., $15.40; ¼ in., $13; 5-16 in., $11; ⅜ in., $10; 7-16 in., $9.80; ½ in., $9.75; ⅝ in., $9.50; ¾ in., $9.30.

Prices per 100 lbs.

FILES AND RASPS

	Per Cent
Globe	50
Vulcan	50
P.H. and Imperial	50
Nicholson	32½
Black Diamond	27½
J. Barton Smith, Eagle	50
McClennand, Globe	50
Delta Files	20
Disston	40
Whitman & Barnes	50
Great Western-American	50
Kearney & Foot, Arcade	50

BOILER TUBES

Size	Seamless	Lapweld
1 in.	$26 00	$.....
1¼ in.	27 25	.....
1½ in.	26 25	29 50
1¾ in.	29 75	27 00
2 in.	29 25	25 50
2¼ in.	33 00	28 50
2½ in.	44 75	31 50
3 in.	49 25	40 00
3¼ in.	.....	48 50
3½ in.	63 50	43 50
4 in.	85 00	55 50

Prices per 100 ft., Montreal and Toronto

OILS AND COMPOUNDS

Castor oil, per lb.	—
Royalite, per gal., bulk	28
Palacine	31
Machine oil, per gal.	58
Black oil, per gal.	27
Cylinder oil, Capital	1.01
Petroleum fuel oil, bbls., net	11.2

BELTING—No. 1 OAK TANNED

Extra heavy, single and double	15%
Standard	15 and 10%
Cut leather lacing, No. 1	2 00
Leather in side	2 40 3 00

TAPES

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

PLATING SUPPLIES

Polishing wheels, felt	$4 50
Polishing wheels, bull-neck	2 00
Emery in kegs, Turkish	8¾
Pumice, ground	06
Emery glue	30
Tripoli composition	9½
Crocus composition	12
Emery composition	11
Rouge, silver	64
Rouge, powder, nickel	38

Prices per lb.

ARTIFICIAL CORUNDUM

Grits, 6 to 70 inclusive	8½
Grits, 80 and finer	6

BRASS—Warehouse Price

Brass rods, base ½ in. to 1 in. rod	30
Brass sheets, 24 gauge and heavier, base	38
Brass tubing, seamless	42
Copper tubing, seamless	44

WASTE

XXX Extra	21	Atlas	19
Peerless	22	X Empire	15
Grand	21½	Ideal	18
Superior	21½	X Press	13½
X L C R	16½		

Colored

Lion	13½	Popular	10½
Standard	12	Keen	9
No. 1	14		

Wool Packing

Arrow	35	Anvil	22
Axle	28	Anchor	17

Washed Wipers

Select White	20	Dark colored	09
Mixed colored	10		

This list subject to trade discount for quantity.

RUBBER BELTING

Standard 10% Best grades 15%

ANODES

Nickel	.55 to .60
Copper	.38 to .40
Tin	.70 to .70
Zinc	.16 to .17

Prices per lb.

COPPER PRODUCTS

	Montreal	Toronto
Bars, ½ to 2 in.	$32 00	$34 00
Copper wire, list plus 10		
Plain sheets, 14 oz., 14x60 in.	34 00	38 00
Copper sheet, tinned, 14 x 60, 14 oz.	40 00	42 00
Copper sheet, planished, 16 oz. base	46 00	48 00
Braziers', in sheets, 6 x 4 base	38 00	41 00

LEAD SHEETS

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$10 50	$14 50
Sheets, 3½ lbs. sq. ft.	10 25	14 00
Sheets, 4 to 6 lbs. sq. ft.	10 00	13 50

Cut sheets, ½c per lb. extra.
Cut sheets to size, 1c per lb. extra.

PLATING CHEMICALS

Acid, boracic	$ .25
Acid, hydrochloric	.03¾
Acid, nitric	.10¼
Acid, sulphuric	.03¾
Ammonia, aqua	.20
Ammonium, carbonate	.23
Ammonium, chloride	.22
Ammonium, hydrosulphuret	.75
Ammonium sulphate	.30
Arsenic, white	.18
Copper, carbonate, annhy.	.35
Copper, sulphate	.10
Cobalt, sulphate	.20
Iron perchloride	.62
Lead acetate	.30
Nickel ammonium sulphate	16½
Nickel carbonate	.30
Nickel sulphate	.17½
Potassium sulphide (substitute)	.40
Silver Chloride (per oz.)	1.15
Silver nitrate (per oz.)	1.10
Sodium bisulphate	.13
Sodium carbonate crystals	.04
Sodium cyanide, 127-130%	.39
Sodium hyposulphite per 100 lb.	6.50
Sodium phosphate	.15
Tin chloride	.80
Zinc chloride, C.P.	.30
Zinc sulphate	.08

Prices per lb. unless otherwise stated

GEOMETRIC

Adjustable Collapsing Taps

Have overcome all the expense and annoyance of tapping screw threads with a solid tap.

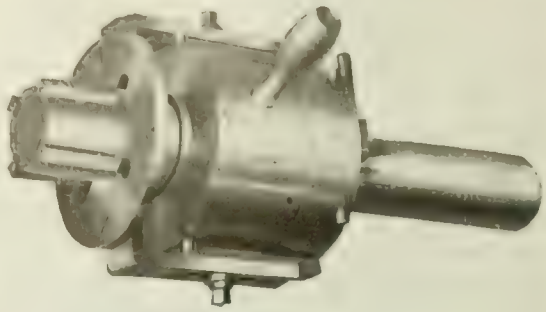
Anyone doing thread tapping knows what backing out a solid tap each time means. It usually means low production, poor threads, and worn-out taps. The mechanism of the Geometric Taps takes care of adjustment to correct diameter each time a thread is tapped; it collapses the chasers automatically, leaving a thread clean cut and perfect.

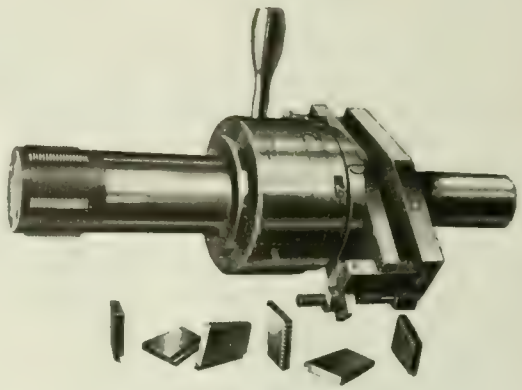
The chasers are readily reground, and when finally used up, are renewed at comparatively small cost, leaving the tap as efficient as when new.

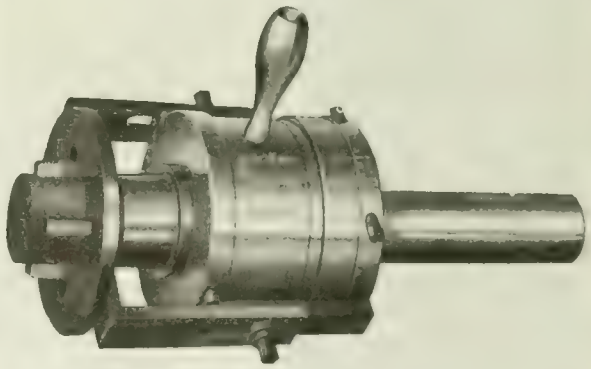
The manufacturers of the Geometric line of Collapsing Taps and Self-opening Die Heads are justly proud of the distinction which is theirs:—

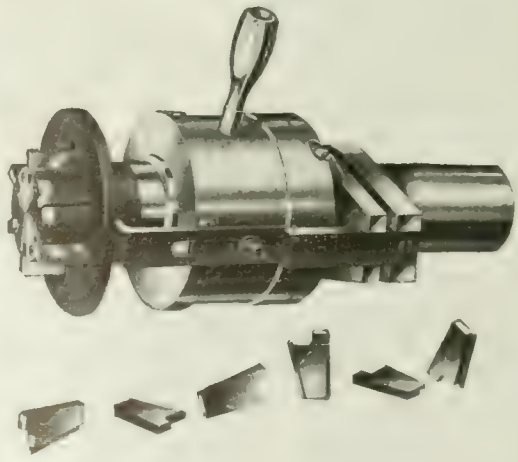
The Originators
and the
Largest and Best Known Manufacturers
of
Automatic Threading Tools

For cutting all classes of screw threads, internal and external, of any diameter and form









The Geometric Tool Company

New Haven, Conn., U.S.A.

CANADIAN AGENTS:

Williams & Wilson, Ltd., Montreal; The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg, St. John, N.B., and Halifax, N.S.; Canadian Fairbanks-Morse Co., Ltd., Manitoba, Saskatchewan, Alberta.

Machine Tool Builders Meet at Cleveland

Matter of Costs Gone Into at Great Length—By Interchanging Ideas and Experiences the Going Can be Made Safer For All —Prices Likely to Decline

THE National Machine Tool Builders' Association, although at first announcing their next meeting at Atlantic City in May, held an important gathering in this city last week, extending over several days. E. F. DeBrul, the new general manager of the association, planned the gathering, considering there was sufficient of importance to discuss and bring before the members without waiting for the May meeting. Judging from the nature of the subjects before the meeting it was deemed advisable to bring the matter of costs, scientifically studied, to the attention of the members before they embarked upon a selling program based on altered prices.

The fact that the members of the association saw the wisdom of the move was well set forth in the attendance at the meeting. The notices were only sent out on February 7, and even on such short notice there was an attendance of 165 members, which sets a high mark for any similar gathering. All sessions were held at the Cleveland Hotel, and nearly all behind closed doors, only members being admitted. There were several reasons for this. The gathering was for the benefit of the members, and it was felt that by allowing none others to attend the sessions would be held more to topics of common interest. The closed sessions were also counted on to draw forth more frank discussion, and this was what the meeting desired above all else. E. F. DeBrul, general manager of the association, and C. Wood Walter, of the Cincinnati Milling Machine Co., formed the press committee.

Practically all sessions on Thursday were taken up with the one matter of "Cost." Mr. Scovell gave the report and findings of the investigation of the Scovell-Wellington Co., cost accounting experts. These covered a very wide range and from them recommendations were made to the association. Following up the same idea, the question of "Overhead" will be taken up at the next meeting in Atlantic City. The afternoon session listened to an address by F. A. Geier on "What Constitutes the Fundamentally Sound Finances for the Machine Tool Business." One point brought out here was that very little outside capital ever found its way to the machine tool business, on account of the big risk and the low returns that had been made in many firms.

J. B. Doan, of the American Tool Works, also gave a talk on the present business situation. To E. J. Kearney, of the Kearney & Trecker Co., was given the very delicate topic of discussing the "Running of a Machine Tool Business in a Period of Depression," in which he went extensively into matters of finance connected with the business.

Some Pleasing Events

Two presentations were made by the members of the National Tool Builders' Association during the day. A handsome silver service was presented to the retiring general manager, Charles Hildreth, the presentation being made by W. A. Viall. In the afternoon some of the members went out to the home of George Merryweather, of Motch & Merryweather Machinery Co. During the war Mr. Merryweather was one of Uncle Sam's dollar-a-year men, acting in the capacity of a purchaser of machine tools for war purposes, and the members felt that they should show their appreciation of the services rendered by one of their number. The expression took the form of furniture for a well-appointed den. A banquet was held in the evening.

The Work of the Association

Friday morning was taken up largely by Mr. DeBrul in discussing the activities of the association. He outlined at length some of the things he considered should be included in the work for the coming year. Charts and graphs, indicating the trend of business activity, supply and demand and the law of averages were gone into minutely. The value of interchanging ideas, statistical information, and other like matter was referred to very directly. The speaker pointed out that years ago the early navigator could run his vessel around in the waters where he was well acquainted. He could make his own little chart for his own little route, but he had to stay right there, and every time he ventured out it became for him a big adventure. But now every rock and channel had been charted through the interchanging of ideas and information, and a captain can sail in strange waters with perfect safety. The only thing necessary is that he shall be able to rightly interpret the charts.

Mr. DuBrul believed that if he were supplied with figures for the next fifteen years it would be possible to compile business charts, which, by taking lessons from the laws of averages, over-stocking, over-production, and therefore cancellations, could do much to correct the resulting evils from these conditions. The present conditions came as the result of ignoring certain well-known laws, and by following the crazy system—if it could be called a system at all. He believed in supplying even the customers with copies of these charts, so that they could more intelligently carry on their business. The course of iron through the year was referred to. At the start all was booming, with stacks working to capacity and sales away up on the percentage chart. And so they drifted on down through the year, but all of them ended up in the dumps in December with sales next to nil. By the use of charts, stocks could be liquidated, thus steadying the market at the most necessary time.

The matter of prices was mentioned several times, but no concerted action will be taken, nor would it be possible to move in this direction, as such action would bring the association within the phase of the law dealing with price-fixing. Members were rather reticent in mentioning this matter, but enough could be gathered to leave the impression fairly well fixed that a movement downward is going to take place, in order to conform with the present prices of other commodities. None of the members believed that such a move would tend to increase sales in the least, most of those with whom your correspondent discussed the situation holding that machine tools were bought because the buyers wanted them for some particular purpose, and not because they were down in price.

Conditions Abroad

At the Saturday sessions H. B. Krant, of Ryerson & Sons, Chicago, who has made several trips to Europe during and since the war, and who has just recently returned, gave a talk on conditions as he had found them, with special reference to their application to the machine tool field. He discussed conditions in England, France, Germany, Norway, Sweden, Poland, Italy, Greece, Russia, and ended up with Roumania. Although conditions were much better now than they had been in those countries, the speaker was of the opinion that there was not much hope for a good market in those counties for some time to come. Exhausted credits and rates of exchange were all against the U.S. selling in Europe.

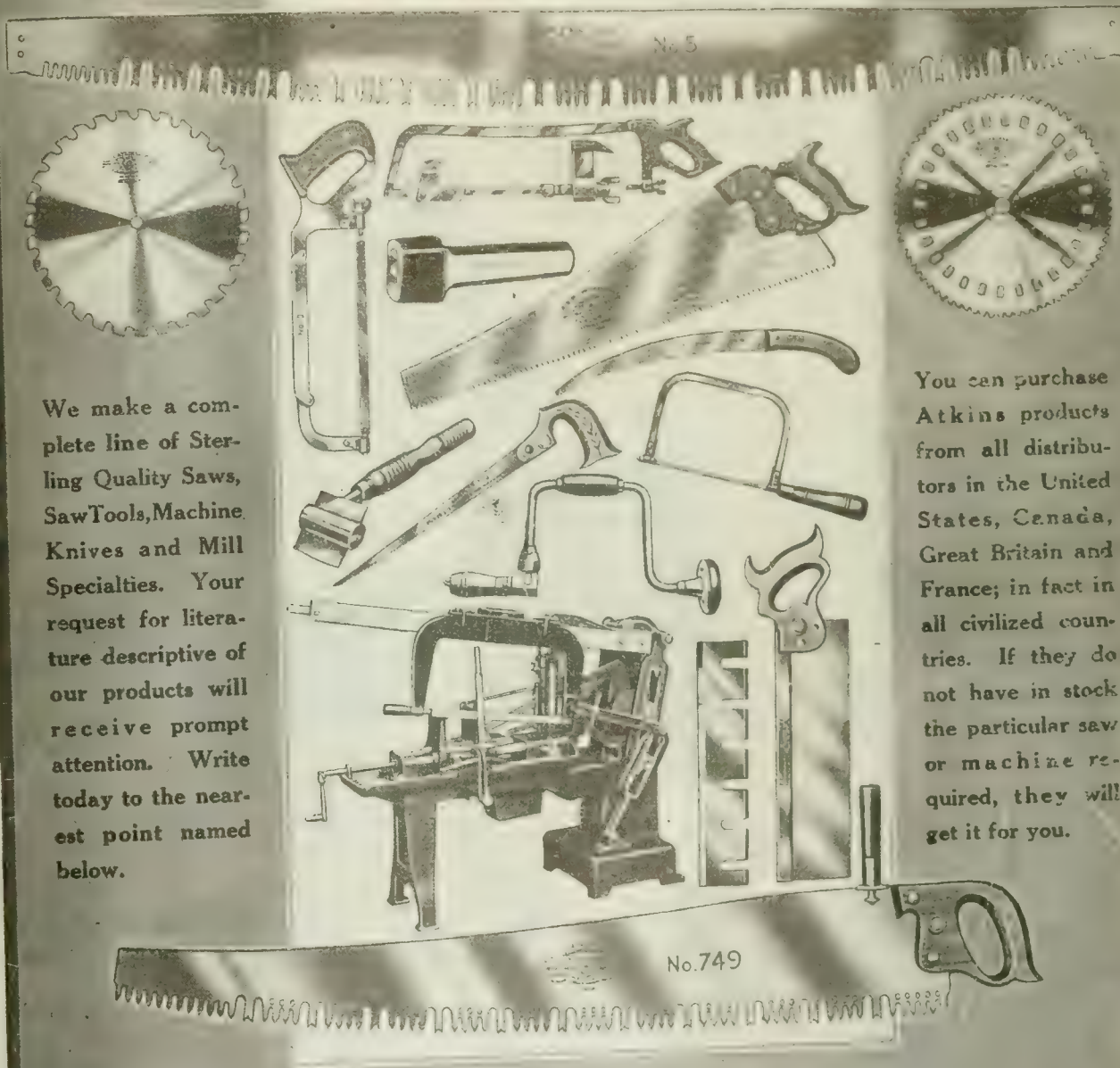
In the closing meeting Mr. DuBrul also dealt with the need for more education, this service to be rendered by the association. Special reference was made to the method of cancellation that was becoming far too common in business. These losses were largely caused by over-production, and over-buying, due to not having proper statistics and a correct knowledge of the consuming power of the buyer.

The Atlantic City meeting of the National Machine Tool Builders will be held as originally planned.

ATKINS
STERLING QUALITY
SAWS and TOOLS
A Perfect Saw for every Purpose

"Finest on Earth"

"Finest on Earth"



We make a complete line of Sterling Quality Saws, SawTools, Machine Knives and Mill Specialties. Your request for literature descriptive of our products will receive prompt attention. Write today to the nearest point named below.

You can purchase Atkins products from all distributors in the United States, Canada, Great Britain and France; in fact in all civilized countries. If they do not have in stock the particular saw or machine required, they will get it for you.

If you have difficulty in obtaining Atkins Saws and other products through your regular service, write

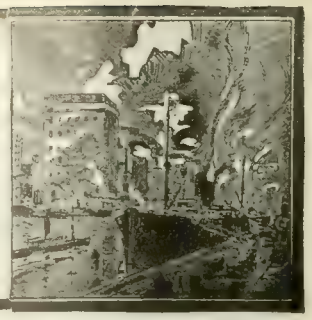
E. C. Atkins & Company

Canadian Factory: [illegible]

Branch: VANCOUVER, B. C.

INDUSTRIAL NEWS

NEW SHOPS, TENDERS AND CONTRACTS PERSONAL AND TRADE NOTES



WILL CORPORATION REDUCE PRICES?

Considerable Speculation Going On As To Why This Move Is Not Taken

Is the United States Steel Corporation likely to reduce its price in order to meet the price slashing that is going on among the independent producers? Judge Gary says prices will stand, but there is a growing feeling that prices are not going to stand very long. There are all sorts of rumors in the steel markets as to why the Corporation adheres to its schedule of March 21, 1919.

One of the most likely seems to be that some of the largest customers of the Corporation have taken on large tonnages at present prices, with a view to using them for carrying out certain manufacturing programmes. Whether this would refer to agricultural interests especially is not certain, but it would seem reasonable to suppose that it would. The fear is expressed that were a lower price brought out—and it would need to be appreciably lower to keep pace with the cutting of the independents—it would cause considerable financial embarrassment to some of these large customers. It would, in fact, more or less cut the ground out from under their feet.

Of course there are well defined limits in Canada to which prices can be cut, before coming under the operation of the dumping clause. A United States firm must sell its product in Canada within 5 per cent. of the reasonable market price in the United States. Of course it can go as much higher as it wishes, but just now the tendency is to get down instead of up. The Steel Corporation capacity of operation continues to get less each week. One very good authority says that they are not running much over 65 per cent. of their capacity now, while the independents are down to around the 20 per cent. mark. The cutting of prices has not resulted in new business being brought into the market.

A reduction in wages was made by the Nova Scotia Steel and Coal Co. at the Sydney Mines plant. About three hundred men were affected by the decrease, which is said to have been necessary in order to keep as many men employed as possible.

TECHNICAL MAN JOINS SALES FORCE

F. J. McCarty Now In Charge of Morrow Company Business In Montreal

The John Morrow Screw & Nut Co. have opened their own warehouse and office in Montreal at 489 St. Paul Street West. It is interesting to note that once more the technically trained man is coming into his own in the field of selling, for F. J. McCarty, A.S.M.E., now in charge of the Montreal office, has come up through the mechanical end of the business.

It is easy to say that it hardly pays to learn a trade now, but just go and ask

F. J. McCARTHY, A.S.M.E.

Mr. McCarty if his technical training is of any use in the selling business. He will soon tell you that it is. Mr. McCarty graduated from the Springfield Technical School in 1904, and then went into practical work in the tool room of the National Needle Company, Springfield, where he finished. We next find him in the experimental and automatic department of the Singer Manufacturing Company. Later he was promoted to the designing of new tools and machinery. Then with the Standard Oil Co. as chief draftsman and designer. Mr. McCarty's first acquaintance with Canada was on the sales force of the Standard Oil Co. In 1910 he joined the Tait-Jones Company, Pittsburg, but still worked on the Canadian field, and during this time was admitted as a member of the A.S.M.E.

In 1915 Mr. McCarty went with the Rudel-Belnap people, at the Montreal office, specializing on heavy machinery, special equipment, and drills. At the first of the present year he went with the John Morrow Co. as eastern representative and manager of the Montreal office.

Mr. McCarty has always been a student of mechanical affairs. So far as Canadian Machinery can learn, he has never had the peculiar sensation of being "fired," lives in Montreal and is bone dry, works hard, expects results, and gets them.

DECREASE SHOWN IN NET INCOME

Annual Meeting of Canada Foundries and Forgings Held At Brockville

The annual meeting of Canada Foundries and Forgings, Ltd., was held at Brockville on February 22, and several changes were made in the personnel of the directorate, among which are several new names. A heavy decrease in net income in 1920 was shown in the statement submitted to the shareholders. After allowing the usual deductions, including bond interest and other miscellaneous expenses, but before the payment of 7 per cent. dividends on the preferred stock, there remained a balance of $90,861. The balance available for application to preferred dividend requirement was equivalent to approximately 8.6 on the $960,000 of senior securities of the company outstanding. After disbursing the full year's dividends on the preferred there remained the amount of $15,053 to apply on the common, or equal to about 1½ per cent. against 10.7 in 1919, some 40 per cent. in 1918 and 54 in 1917.

Among the changes in the executive of the enterprise is noted the return of W. M. Weir, as president, succeeding T. J. Dillon, whose resignation was announced a short time ago. Mr. Weir retired from the position of president last year, but remained on the board. The board now stands as follows: Wm. M. Weir, president; Hon. George P. Graham, vice-president; Hon. W. J. Shaughnessy, Montreal; Lt.-Col. C. M. Monserrat, Ottawa; W. T. Sampson, Gananoque; Lt Col. C. W. McLean, W. D. Robb and B. F. Conway, Montreal; James Arnold, general manager, Brockville; and J. H. Briggs, Brockville, the latter being also secretary-treasurer.

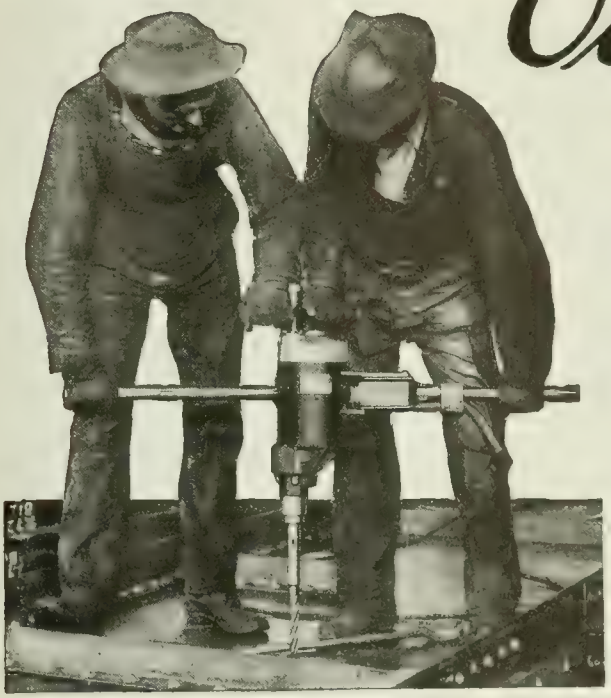
Aikenhead's

A Manufacturer, in offering his products, must choose a worthy representative—else his products lose prestige.

Aikenhead's is Canadian Headquarters of many of the world's largest manufacturers of fine tools.

Two well-known samples are shown below.

Van Dorn ELECTRIC TOOLS

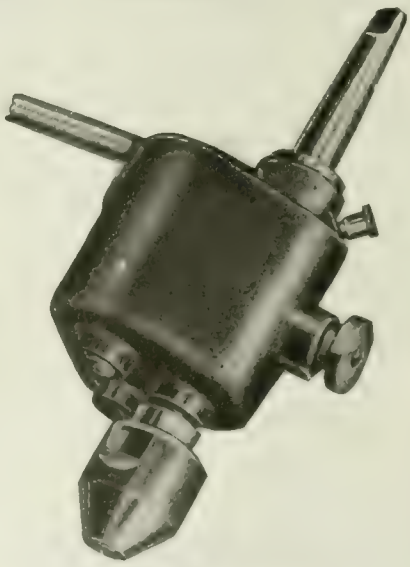


Van Dorn Electric Drills make neat, clean holes 50 per cent. faster than the best pneumatic drills.

For 15 years Van Dorn Electric Drills have been the recognized standard by which all portable electric drills are judged. They are both fool and trouble proof. Such quality insures continuous service on your work.

Buy them at Aikenhead's.

WAHLSTROM'S Tapping Attachment



Why stick to the old slow and expensive practice of Hand Tapping when you can do the same work in one-tenth the time with a Wahlstrom Automatic Tapping Attachment? It imitates the simple to-and-fro motion of hand-tapping and will tap holes as squarely as they could be drilled. For tapping in soft materials the oscillating motion can be changed to a continuous revolution.

Made in two sizes. No. 1 takes taps of all sizes from 5.40 to 1-2 inch standard. No. 2 takes taps from 1-4 inch to 3-4 inch. **Buy them at Aikenhead's.**

Aikenhead Hardware, Limited

17 Temperance Street, Toronto, Ont.

If interested tear out this page and place with letters to be answered.

FEAR MERGER MAY INTERFERE WITH DEVELOPMENT IN PICTOU

THE resignation of Felix Notebaert as general manager of the Acadia Coal Co., Ltd., has called for some criticism in the east, and there are those who see in it a letting up of certain developments that are much desired, especially in Pictou County.

In a recent issue the Evening News of New Glasgow said:

"* * * * The proposed British Empire Steel merger was never particularly popular in Pictou County. The general feeling was that Nova Scotia could work out its own salvation and that it could best do so by big developments in its native county.

"In a word, the public believed that with Mr. D. H. McDougall at the helm the future of Trenton and New Glasgow was assured, that with Mr. Notebaert as his lieutenant at the collieries the future of Stellarton, Westville and Thorburn was also assured, and that what has been done heretofore was only an earnest of what the future had in store for us.

"That Mr. D. H. McDougall will grapple with the situation and straighten matters out is generally hoped. The public have confidence alike in his ability and in his sagacity. He has handled other situations just as trying and come out on top. What the people of Pictou County now want and expectantly look to him for is (1) no entangling alliance which would imply that the identity of Scotia would be lost, (2) a policy of expansion at Trenton, and (3) continued and accelerated expansion of the Acadia collieries with Mr. Notebaert as general manager for many years to come.

"Mr. Notebaert, we may say in conclusion, may have an idea that the people of Pictou County would rather have a "native son" or a man of English descent in charge of the Acadia collieries. There was a time when that feeling did exist, there was a time when we thought so and said so, but by sheer force of his personality, by his splendid record, particularly as a mining expert, and by his fair treatment of his employees, Mr. Notebaert has not only worn down adverse sentiment, but he has also won a place in public esteem so marked that the consensus of opinion is that he cannot be replaced, and that he must not be allowed to go if there is any way under Heaven of preventing it."

Start to Work.—A number of the employees of the Hercules Rubber Co., Ltd., Brampton, Ont., commenced work on Monday. Mr. Fairty, the manager, is hopeful that the full staff will be taken on in the course of a couple of weeks. Orders for spring delivery continue to come in and prospects for the coming season are bright.

BROKEN HILL PLANT CLOSED

A cablegram from Melbourne, Australia, reports that the New Castle Steel Works of the Broken Hill Proprietar, Co., Ltd., has been closed on account of the strikes at the mines of the company. The New Castle Steel Works employs about 5,000 men. During the year ending May 31, 1920, the company produced 296,000 tons of pig iron from two furnaces with a combined capacity of 1,000 tons daily. An additional furnace of 500 tons daily capacity has since been added and preparations are under way for the installation of a fourth blast furnace.

MR. J. N. TALLMAN DIES IN HAMILTON

President of the Tallman Brass and Metal Co., and Was in Business For Quarter Century

Joseph Nelson Tallman, well-known brass manufacturer and president of the Tallman Brass and Metal, Ltd., Hamilton, died at St. Joseph's Hospital. Mr. Tallman had been ailing for some time past but the news of his death will come as a shock to a wide circle of friends. He was born in Hamilton on North John street 73 years ago and had been a resident here practically all his life. He was a member of the First Methodist Church and held the office of trustee and member of the quarterly board of the church for a number of years. He was one of the oldest members of the A.O.F. and Chosen Friends, but during the last few years did not take an active part in these organizations. In 1896 Mr. Tallman purchased the brass business on North Wellington street from William Hunter and since that time has enlarged the plant, which is now situated at the corner of Sanford avenue and Wilson street.

In business circles deceased was well known and he took a very active and prominent part in the management of his firm until his last illness. He is survived by his widow, two sons, William and A. H., of Hamilton; three daughters, Mrs. W. B. Anstey and Mrs. R. Hill, of Hamilton; and Miss Alma, at home; one brother, Walter H., of Penetang, and three sisters, Mrs. L. Bowron, of Hamilton, Mrs. C. Duff, of Ancaster, and Mrs. D. Woon, of Toronto.

POURING 50 TONS

Continued from page 87

be let loose, some of the brickwork taken out. That fifty-ton mass was going to cool off, and it had to have a chance to contract evenly—otherwise, in plain talk, something might bust. And so little by little things will be stripped and taken away until that hundred thousand-pound chunk is ready to be heaved out of its pit and travel off with the rest of the trinkets that go with it to make up the world's largest dynamo. Some of these trinkets have been finished. One of them was sitting on a flat car, but how that car was going to get out of the door was more than I could tell, unless they took a bite out of the wall.

But the iron men talk in tons up at that shop just now. This piece is forty tons, that one seventeen, another a mere trifle like thirty or so. Finished, it will be around 300 tons.

It's a real man's job turning out such work as is being done at the Allis-Chalmers shop just now.

CALLS IT BUSINESS IMMORALITY

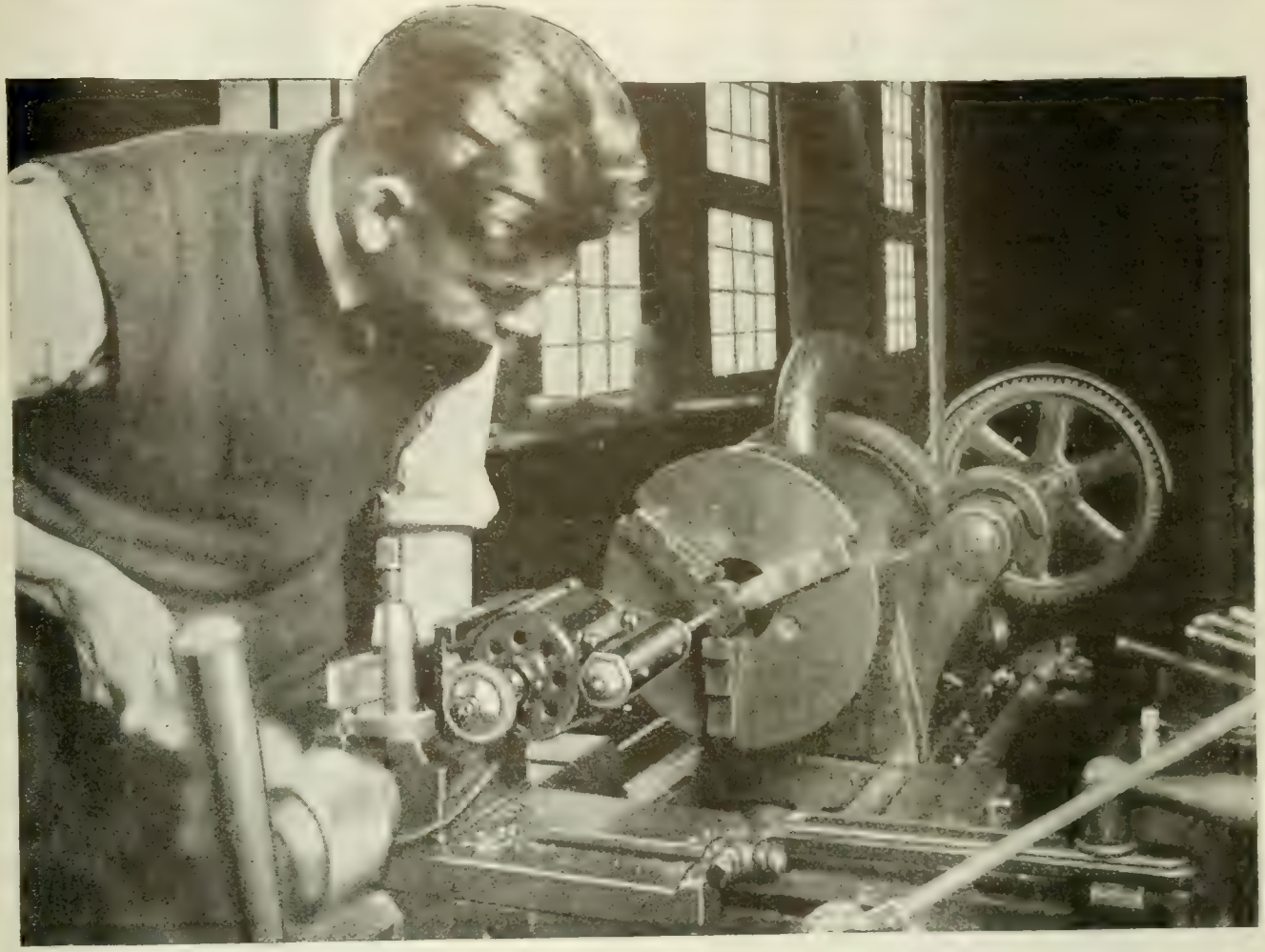
By CHARLES PIEZ, President Link-Belt Co., Chicago

ONE of the discouraging, if not alarming, symptons attending the present business depression is the attitude of the merchants, dealers and jobbers on the subject of cancelling orders. While a sudden and severe reduction in demand may warrant a distributor in holding up or cancelling an order, there is absolutely no justification for the position taken by many distributors that they can cancel or reduce orders without incurring any obligation.

If manufacturers are going to permit distributors to escape responsibility for losses involved in cancellations, then they will encourage overpurchases in the future, with the loss and derangement to business which such overpurchases and consequent cancellations involve.

It is only when a merchant, dealer or jobber realizes the responsibility he is under when he places an order, that he will investigate conditions before he buys, and base his order on an intelligent estimate of the demand.

The widespread feeling that orders can be cancelled with impunity must be cured by a more vigorous and definite insistence on accountability for losses involved; for it is essential to the continued soundness of our business structure that this piece of business immorality be permanently stamped out.



Grinding Diameters on Ring Gages to Close Limits

In the Terry Turbine Company of Hartford, Conn., Dumore Grinders are used on jobs where accuracy is of the utmost importance.

The job shown here is a special Gage—diameter .750-in. with plus or minus limits of .0002 in. Because the Dumore grinds to extremely close limits it is just the tool for work of this character. Besides, the ease with which it can be set up for service wherever necessary gives it an advantage over other methods of handling many kinds of work.

Dumore Grinders can be used anywhere, taking their power from the nearest lamp socket; extremely simple and durable, they offer an economical method for accurately finishing work without changing the setting.

See the Dumore at work. Ask a man who uses one. Or have your dealer give you a demonstration.

Wisconsin Electric Company

2933 Sixteenth Street - Racine, Wisconsin

DUMORE HIGH SPEED GRINDERS

If interested tear out this page and place with letters to be answered.

B. C. PAYS BOUNTY FOR PIG IRON NOW

On Finished Iron From B. C. One Company Will Get $3 Per Ton

Victoria.—To encourage the establishment of the iron and steel industry in British Columbia, the Provincial Government has entered into an agreement with the Coast Range Steel, Limited, whereby the Government promises to pay bounties not exceeding $3 per long ton on pig iron manufactured from ore mined in the province. The agreement sets forth that British capitalists are prepared to invest the necessary capital, "not exceeding £10,000,000," in the establishment of the industry. Engineers are now investigating the resources to ascertain if conditions are suitable for the establishment of the industry.

NEW PRICES NAMED BY READING CO.

Reading, Pa.—At the annual election of officers and directors of the Reading Iron Company, one of the largest independents in the East, prices were substantially cut, effective March 1. The company operates nine plants here, at Columbia, Pottstown, Birdsboro' and Danville.

The company announced a reduction of from $8 to $10 a ton in the selling price of tubular products. The price of cut nails and bar iron was reduced several weeks ago. These reductions are made with the hope that they will bring in orders sufficient to run the plants at a better rate of production. Orders received during the last two months were the lowest in the history of the company, and unless orders are received the outlook is not bright.

GOING AHEAD TO LOCATE COAL

Reports of provincial analysts and other kinds of geologists have not cooled the ardor of those who believe there is coal around Shelburne, Dufferin County.

A while ago investigations were made, and as a result a very discouraging report was made to the effect that the chances of finding coal in such surroundings were nothing at all.

The sequel comes in this announcement in the Official Gazette:

Two million dollars is the authorized capital of the Chamberlain Coal and Oil Development Co., Ltd., which has been granted letters patent and will have its head office in the village of Shelburne.

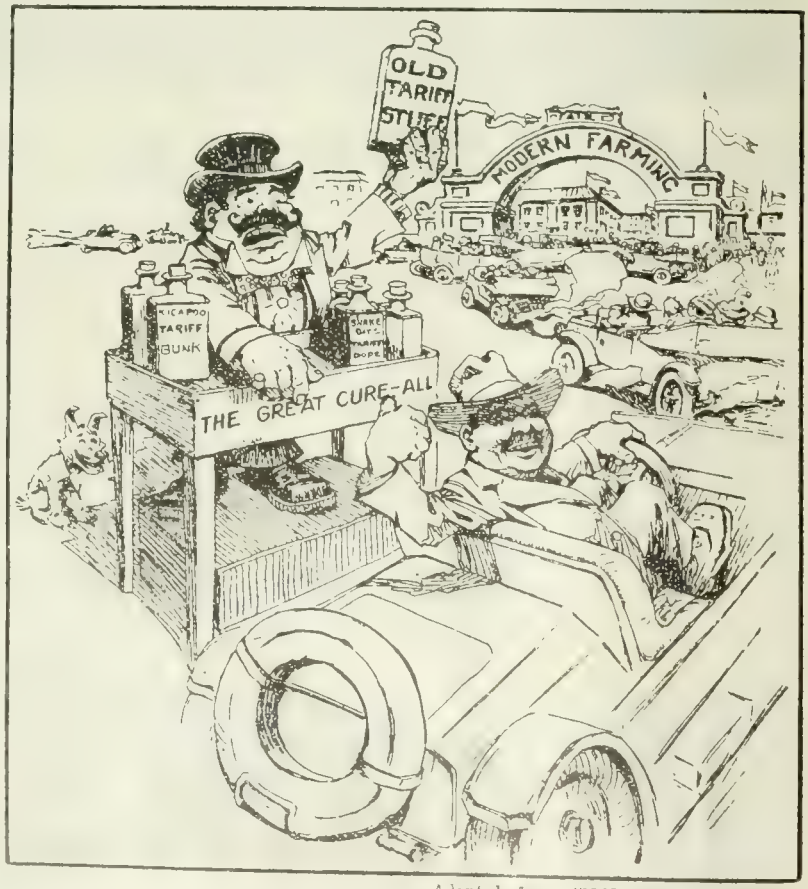
The new company under its charter is authorized (a) To acquire, own, lease, prospect for, open, explore, develop, work, improve, maintain and manage mines and mineral lands and deposits; and (b) to take, acquire and hold as consideration for ores, metals or minerals, including oil and gas, sold or otherwise disposed of, shares, debentures or other securities and to sell and otherwise dispose of the same; with a capital of two million dollars, divided into two million shares of one dollar each; its head office at the village of Shelburne, in the county of Dufferin.

ENGINEERING

New Company.—The Canadian Toledo Scales Co., Ltd., has been incorporated with head office at Windsor and capital stock of $350,000 to carry on the business heretofore carried on in Canada by the Toledo Scale Co. of Toledo, Ohio, and to carry on the business of mechanical engineers and dealers in and manufacturers and operators of plants, engines and other machinery, including scales and weighing and testing machines of all kinds.

Want Guarantee.—The National Shipbuilding Company, of Goderich, which was organized in 1917 to build trawlers to the order of the British Admiralty for use in the North Sea, are asking the town council of Goderich to guarantee a bond issue that has been created on the property and assets of the company. The organization is perfecting and manufacturing a flax-pulling machine of the Vessot model, on which the patent rights are held both in Canada and abroad. Marine engines and boilers were made for the Imperial Munitions Board, the French government and the United States Emergency Fleet Corporation. Before the shipbuilding industry began to subside, the National Shipbuilding Co. turned its attention to the manufacture of the flax-pulling machine. In asking the municipality to guarantee the bond issue, the company points to its record including wage payments aggregating $400,000 for three years and nine months ending December, 1920.

A large British factory, which was erected during the war chiefly for the production of "dope" or varnish for aeroplane purposes, is turning its attention to the application of these and other products as peace time products. It has been found that this aeroplane dope makes an excellent insulating varnish for electrical machinery. Further, paper strips drawn through the solution become impregnated with it and are then suitable for winding on copper wires to make "paper-insulated" cables for telephone and electric power purposes. Artificial silk, which can be braided on to wires instead of the natural silk, is also produced; and still another possible line of development is in the molding of electrical connections in celluloid, which has a very high electrical resistance and is non-flammable even when exposed to the heat of a fierce flame. All these products are "synthetic"; that is to say, they are built up by chemical processes from simple constituents.

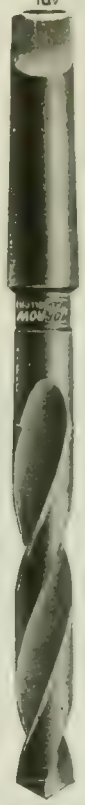


Adapted from "N.Y. Evening Post."

HE DOESN'T GET THE ATTENTION HE USED TO.

MORROW!

It Means So Much to You to Say "MORROW'S" When Ordering Drills



TAKE NO OTHER---
MORE HOLES

Please Note Our New Montreal Address is :
John Morrow Screw and Nut Co., Limited
489 St. Paul Street West
MONTREAL, QUE.
Telephone : Main 8418

Set and Cap Screws, Semi-Nuts, Engine Studs
P-H and IMPERIAL FILES
Nothing Better

WORKS AT
INGERSOLL

If interested turn at this page over and place with letters to be answered.

Upon the Health of your employees depend your profit and production

Throw out the germ-laden Drinking Cup!

Give your men a clean drink

PURO SANITARY DRINKING FOUNTAIN

(MADE IN CANADA)

Puro Sanitary Drinking Fountain Co.

Canadian Agents:

McKENZIE BROS.

888F St. Andre St., Montreal, P.Q.

Why Reduce Your Production

PROMPT DELIVERY

Also Manufacturers of DICKOW SUPERIOR EIGHT" Precision Lathes

Dependable and Accurate

Write us to-day for complete description

ACCURACY DICKOW QUALITY

FRED. C. DICKOW MACHINERY CO., Not Inc., 3504 W. Lake St., CHICAGO, ILL.

PATENTS ATTORNEYS

PATENTS

Fetherstonhaugh & Co.,

The old established firm. Patents everywhere. Head office Royal Bank Bldg., Toronto. Ottawa office, 5 Elgin St. Offices throughout Canada Booklet Free.

PATENTS PROMPTLY SECURED

In all countries. Ask for our Investor's Advisers which will be sent free.

MARION & MARION 364 University St.

Merchants Bank Building, corner St. Catherine St., Montreal, Phone Up. 647, and Washington, D.C., U.S.A.

MACHINE TOOLS for Shipbuilders & Iron & Steel Works

BERTRAMS LIMITED

SCIENNES EDINBURGH

MACHINERY SUPPLIERS

MANUFACTURERS REQUIRING MACHINERY can with advantage obtain speedy delivery, through our Surplus Plant and Machinery Dept., constituted some years ago for the handling of Surplus Plant, of Boiler Works, Ship Yards, Engineering Works, etc. New or Good Used Plant as required. Please send enquiries. Pillatt & Co., Ltd., Stapleford Iron Works, Nr. Nottingham, England.

OVENS

Brantford Oven & Rack Co. Ltd.

Brantford, Canada

DROP FORGE DIES

Send us your blueprints and specifications. Entrust your requirements to experienced workmen and up-to-date equipment. Have your dies made in Canada. First-class workmanship guaranteed.

THE KIMBER & HILLIER MFG. CO., Thorold Road, - St. Catharines, Ont.

HAMILTON ENGINEERING SERVICE LIMITED

Consulting and Designing — Tools, Jigs, Fixtures and Special Machinery. Let us solve your problems.

17 MAIN ST. EAST, HAMILTON

TRADE GOSSIP

A sheet metal shop will be built by E. Batisti, 140 McEwan Ave., Windsor, Ont.

The Board of Control is contemplating the erection of a garage on Lombard St., Toronto.

The Transparent Rubber Co., on Danforth Ave., Toronto, will rebuild their factory which was recently destroyed by fire.

A new industry has opened a factory at Selkirk, Man., and is known as the Canadian Insulation Company. The head office is in Winnipeg.

Ellis-McIntyre Motors Ltd., Hamilton, Ont., has been incorporated with a capital stock of $150,000 to manufacture automobiles, trucks, tractors, etc.

The Monarch Industries, Ltd., Beamsville, Ont., has been incorporated with capital stock of $300,000, to manufacture registers, carburetors, motors, etc.

Plans are being prepared by Downing and Kayll, architects, 525 Seymour St., Vancouver, for the erection of a hotel to cost $1,500,000 for an Eastern syndicate.

J. M. Schneider & Son, 63 Courtland Ave. E., Kitchener, Ont., are building a garage costing $10,000. W. H. E. Schmalz, architect, Frederick Street, is preparing the plans.

A new firm, known as the Drifting Sand Filters, Ltd., has been recently incorporated with head office at Toronto. Filters such as those installed at Toronto Island will be manufactured. Mr. E. L. Cousins, manager of the Toronto Harbor Commission, is the president.

It has been stated that tenders will be called shortly for alterations and addition to building at an estimated cost of $40,000 for L. R. Steel Co., Ltd., Royal Bank Building, Toronto. The architects are Gardiner and Mercer, 718 Granville St., Vancouver.

Plans are being prepared and bids will be called in the near future for airplane hangars and a machine shop to cost $75,000 for the Dominion Government Militia Department, Ottawa, Ont., to be erected at Vancouver, B. C. Major McLaurin, Hotel Vancouver, Vancouver, B.C., is superintendent of Jericho Station.

The Westinghouse Electric and Mfg. Co., East Pittsburg, has announced a wage adjustment, effective March 1, which cuts the present pay of workmen approximately 15 per cent. The announcement, made by H. P. Davis, vice-president in charge of operations, states that the cut is due to competitive market conditions, the decline in prices and the decrease in volume of business.

The death occurred on February 26 of G. R. Baker, 615 Huron St., Toronto, who for many years had been a member of the engineering firm of Westman and Baker. He was an active member of the Lakes Association of Muskoka, and commodore of the Toronto Canoe Club.

PERSONAL

Joseph Pearce, Brockville, Ont., has retired after forty-eight years of service as locomotive engineer on the Grand Trunk Railway. His period of service dates from the time of wood burners which he fired on the old Brockville and Ottawa Railway. Since 1875 he has been with the G. T. R. in freight service between Brockville and Montreal.

A Welland despatch says: It is announced that T. J. Dillon has resigned from his position as president, general manager and director of Canada Foundries & Forgings, Limited, with plants at Brockville and Welland, which over a period of years under his management has been built up into one of the strongest Canadian manufacturing institutions, with an enviable reputation and records for earnings. Mr. Dillon is well known amongst the manufacturers in this country as one of the leading steel men. He will interest himself vigorously in manufacturing different lines of steel products in Welland and the Niagara district. "I am going to operate right around Welland," said Mr. Dillon, "and help to make this a bigger and better city to live in."

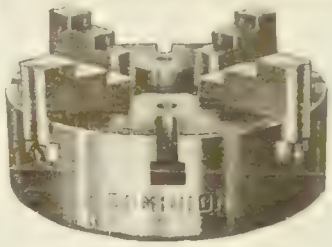
MACHINE SHOP PRACTICE

A rather interesting book, entitled "Elementary Machine Shop Practice," has been issued by the D. Van Nostrand Co., 8 Warren St., New York. This is really a text book presenting the elements of the machinist's trade, and the author, James A. Pratt, who is a mechanical engineer, is also director of the Williamson School of Mechanical Trades. The price of the book is $2.50 and it is well illustrated throughout, in fact there are over 200 illustrations.

Briefly, here are the contents in chapters: Bench and Bench Work; Supplies and Miscellaneous Tools; Hardening and Tempering; Machine Adjustments; General Tools; Lathe Tools; Lathe Backrest, Follow Rest, Compound Rest, and Eccentric Turning on Lathe.

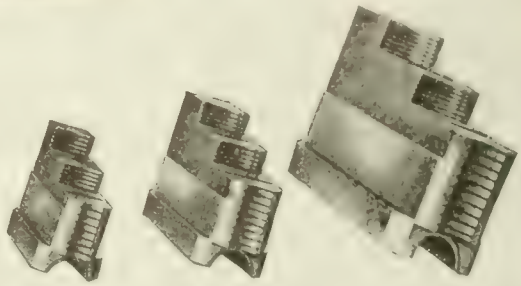
Drill press, shaper, slotter, grinder, and miller work; also problems in gearing. Planer work, machine shop calculations and machine glossary, including tables, etc., etc.

At the end of each chapter is a number of questions which the reader should be able to answer for his own peace of mind, if he has been intelligently reading the contents. This is a good idea, for it has the tendency of making the reader be careful in his perusal. There are many existent who believe a short reading of a technical book should make them more efficient immediately. This is not so, for to get the most out of any book, especially a technical book, you must not only read, but study the contents. Taken in all, this book should interest the budding mechanic who is anxious to get on.



DOMINION CHUCKS

STEEL OR CAST-IRON BODY
BUILT FOR HEAVY DUTY



The Jaws Are Extra Strong

THEY are drop forgings, made of best quality steel, heat-treated and hardened. The threaded portion of jaws form a half nut for the setting-up screws. Have stood the test of heavy duty work in our own shops where accuracy was the only accepted standard.

DOMINION STEEL PRODUCTS CO.
LIMITED
Engineers • Manufacturers
BRANTFORD, CANADA

3

WIRE SPRINGS OF ALL KINDS

Machine Springs, Valve Springs, Automobile Cushion Springs, etc., of a quality that defies competition. Tell us your requirements. Send sample or specification for price.

JAMES STEELE, LIMITED
GUELPH, ONTARIO

"Maple Leaf" BRAND
Stitched Cotton Duck Belting

"Maple Leaf" [illegible] than leather, rubber and balata; [illegible] grip on the pulley and is true run-[illegible]

Have us send you samples and see just why "Maple Leaf" sets the standard in economy, strength and durability.

Dominion Belting Co. Ltd.
Hamilton, Canada

Quebec Branch 51 Duluth Bldg., Montreal

No. 4 Press
10 to 12
tons

Write for complete information on Atlas Arbor Presses. All sizes for all purposes.

ATLAS PRESS CO.
330 N. Park St.
Kalamazoo, Mich., U.S.A.
Canadian Representatives:
Chas. A. Strelinger Co., Windsor, Ont.

Classified Opportunities

PATTERNS

TORONTO PATTERN WORKS, 65 JARVIS Street, Toronto. Patterns in wood and metal for all kinds of machinery. (ctfm)

BRANTFORD PATTERN WORKS ARE PREpared to make up patterns of any kind—including marine works—to sketches, blue prints or sample castings. Prompt, efficient service. Bell 'Phone 631; Machine 'Phone 733. Brantford Pattern Works, 49 George St., Brantford, Ont. (ctfm)

FOR SALE

FOR SALE — COMPLETE EQUIPMENT FOR the manufacture of Bench and Machine Vises including patterns, jigs, templates, special tools, etc. Going out of the manufacturing business on account of ill health. Bargain for quick sale. This is a production proposition, specially suitable for plant with foundry and wishing to add profitable additional line with well established connection. Apply Box No. 756, Canadian Machinery.

BOILER FOR SALE — CAPACITY 150 H.P., horizontal tube size 72" x 16 feet long, working pressure 110 lbs. steam. Government inspection certificate. Apply The Steel Company of Canada, Limited, Canada Works, Hamilton, Ont.

FOR SALE

Perfected rotary engine valve, simple design, free from defects common in rotary valves. Patented Feb. 20, 1917. Can be inspected at and purchased from H. W. Petrie Limited, Toronto.

FOR SALE

Enclosed liquid fuel combustion apparatus capable of generating intense heat in pipes and confined passages for heating parts of internal combustion engines and for other uses; spark ignited; blower operated. Patented April 3, 1917. Can be inspected at and for sale by H. W. Petrie, Limited, Toronto.

Re-Built Machinery For Sale

1—24" x 12' Canada Machinery Lathe.
2—22" x 10' Davis Lathes.
1—21" x 10' London Lathe.
6—20" x 8' C.M.C. Lathes.
1—18" x 8' Mueller Lathe.
1—18" x 8' London Lathe.
3—18" x 8' C.M.C. Lathes.
1—16" x 6' McDougall Lathe.
1—14" x 8' London Lathe.
1—14" x 6' Flather Lathe.
2—No. 1 Racine Hack Saws.
1—20" McDougall Drills.
1—22" Barnes Drill.
1—28" Barnes Drill.
1—D-1 H.D. Colburn Drill.
2—No. 24 H.D. Foote-Burt Drills.
1—16" C.M.C. Shaper.
1—24" Rockford Shaper.
2—2" x 26" Pratt & Whitney Turrets.
1—10" x 52" Plain Landis Grinder.

Specifications and prices sent upon request.

Yeates Machinery, London

Hale St., London, Ont.

HELP WANTED

WANTED AS ASSISTANT EDITOR, ON group of technical papers, live-wire mechanical engineer. Qualifications required are: Age, under 45; good education; certain amount of practical experience; ability to express ideas on paper; good mixer and aggressive worker. Splendid opportunity for the right man. State full particulars in first letter, mentioning present salary. Box 152, Canadian Machinery.

POSITIONS WANTED

YOUNG MAN, MARRIED, 35 YEARS, AMERIcan, technical and metallurgical training, tool room foreman, superintendent or manager. Position where opportunity assured. Combined shop and office experience. Box 55, Canadian Machinery, 128 Bleury St., Montreal. (c9m)

I WILL BE IN A POSITION WITHIN TWO weeks to accept charge of a drop forge, or machinery blacksmithing plant. Can design all types of bending and forming dies, and have had 30 years' experience in this class of work. Box 753, Canadian Machinery.

MECHANICAL ENGINEER WITH 16 YEARS' experience in mechanical shops and drawing offices, executive for the last 7 years, and 2 years' selling experience, is looking for responsible position with good manufacturing concern. Familiar with building construction, plant maintenance, fire protection, and efficiency principles. Age 35. Box 754, Canadian Machinery. (c9m)

Modern Marine Machinery

Automatic Steam Towing Machines, Ship Windlasses, Cargo and Deck Winches, Steam Capstans, Dock Gypsies, Steering Engines, Hydraulic Freight Hoists, etc. Grey Iron and Brass Castings. Special machinery built to order. The Corbet Foundry & Machine Co., Limited, Owen Sound, Ont. (52)

Grey Iron Castings

Light and Medium-Bench and Floor Repetition Castings. Capacity 15 tons per day.
Expert Metal and Wood Pattern Work. Our advice and estimates will save you money.
Semi finishing operations on Lathe or Grill on Castings supplied if required.
ASK US.

THE KATIE FOUNDRY, GALT, ONT.

REGO WELDING *and* CUTTING APPARATUS

Oxygen, Acetylene, and a complete line of Welding and Cutting Supplies.

Carter Welding Co. of Toronto, Limited
7-11 Sheppard St., Toronto, Ont.
Phones: Adelaide 2841 and 1524
(TF)

MACHINE WORK WANTED

MACHINE WORK WANTED FOR LATHES, shapers, milling machine and planer, etc. Hourly or contract basis. Prompt delivery. W. H. Sumbling Machinery Co., Toronto. (etfm)

MACHINERY WANTED

WANTED—NEW AND RE-MANUFACTURED gas and gasoline engines, boilers, saw-mill machinery, planing mill and sash and door factory machinery. New and manufactured iron and wood-working machinery. Electric motors, dynamos, direct connected steam operated generators, portable electric tools. Builders' hoists, elevators. Box 739F, Canadian Machinery.

IF YOU HAVE IRON-WORKING OR WOODworking machines for sale, or idle machine shop equipment, call or write Canada's largest dealers in new and used machinery. H. W. Petrie Limited, Toronto, Ont. (cfm)

ONE SINGLE STAND 9 x 18 ROLL IN GOOD condition; one receiving separator, capacity about 1,000 bushels per hour. Crane Bros., 817 Ferry St., Niagara Falls, Ont.

Machinery Wanted

Advertisements under this heading will be inserted once free of charge. Readers are invited to use this department when in need of equipment. Replies may be sent to box number, care of Canadian Machinery, if desired.

MACHINE WORK WANTED

We are equipped to handle all kinds of general or special machine work. All operations in our plant are done under the most careful supervision and we can satisfy you as to price. Always available for consultation.

PERFECT MACHINE COMPANY, GALT
Builders of Reliable Machinery.

FOR SALE

One 14" x 9' x 12" CANADIAN INGERSOLL-RAND two-stage Intercooled Air Compressor, capacity 400 cubic feet per minute at 220 r.p.m. 100-lb. pressure, complete with 75 h.p. motor and 3' x 9' air receiver. In excellent condition. Price $1,250.

Box No. 755
Canadian Machinery

Classified Opportunities

ATTENTION!
JOBBERS and DEALERS
Engineering Supplies

There is absolutely no reason for paying exchange on your purchases of asbestos packings, gaskets and tape. We manufacture a line that is equal to any imported article and sold to jobbers at a price that allows a good margin of profit with protection. If you are not handling our line you are working at a disadvantage. Write us for set of samples, circulars and prices.

OUR LINE INCLUDES :

Tiger Superheat Metallic Piston Packing
Tiger High Pressure Piston Packing
Flax Packings
Asbestos Gaskets
Asbestos Tape

GUILDFORD & SONS LIMITED
HALIFAX, N.S.

THIS WEEK'S SPECIALS

Equipment That Pays For Itself in Service

2 26 x 12 C.M.C. Lathes, 3 step cone, D.B.G., Q.C.G., compound rest and hollow spindle with extra tool post turrets and quick return, now under belt.

No reasonable offer refused.

You do not need to wait for falling prices you are the judge and jury.

If you need machines as badly as I need the money, it is time for you to come in.

Our motto is to supply our patrons with tools of first grade quality at low prices.

R. S. HOLLY
SUITE 502 KENT BUILDING PHONE ADEL. 3147
TORONTO, ONTARIO

Buy the Brand Your Work Requires

ELK FIRE BRICK

Are made in a great variety of mixtures and chemical compositions, and when you order a certain brand of **Elk** you may be sure that it is the one brand to give you the best results. We never recommend a high-priced brick if a lower-priced brand will give equal service.

OUR BRANDS

"Elkco"	"St. Marys"	"Elk Dust"
"Elkco" Special	"Keystone"	"Keystone Dust"
"Elk Steel"	"M.D. Elk"	"Rotex Dust"
	"Rotex"	

It is time to make the acquaintance of ELK quality and reliability. Large stocks from our warehouses at Hamilton are now available.

Elk Fire Brick Company of Canada
Limited
Sun Life Building, HAMILTON, ONTARIO

STOCK SHIPMENTS

AUTO BODY SHEETS

18 Ga. 38″ x 96″ Regular — Oiled
20 Ga. 30″ x 96″ Regular — Oiled
22 Ga. 30″ x 96″ Deep Drawing— Oiled
23 Ga. 30″ x 96″ D. D. Silver Finish.

COLD ROLLED STRIP STEEL

BLACK AND GALVANIZED SHEETS; BRASS AND COPPER SHEETS, RODS, TUBES; FLEXIBLE STEEL STEAM HOSE; COLD FINISHED STEEL BARS; TIN PLATE.

We Solicit Your Enquiries
Lists Sent on Application

ONTARIO METAL PRODUCTS
CO., LIMITED
237 Dufferin St., TORONTO, Canada

Classified Opportunities

GARLOCK-WALKER LIST

If You Want Machine Equipment, Send Us Your Enquiries

We have one of the largest stocks of new and used metal and woodworking machines in Canada.
Many machines only very slightly used and all absolutely guaranteed.
A few machines from our Toronto stock at exceptionally attractive prices are:

LATHES

1—30" x 12' "Blaisdell" (used).
1—30" x 14' "Niles-Bement-Pond" (used).
1—26" x 14' "Niles-Bement-Pond" (used).
1—24" x 10' "Milwaukee" (new).
1—18" x 8' "Rae" (new).
1—16" x 6' "Reed" (used).
1—12" x 8' "LeBlond" Tool Room (used).
1—8" "Rivett" Cabinet Type, full attachments (used).
1—7" "Cataract" Precision (new).

GAP LATHES

1—38" x 54" x 12' Bertram (used).
1—22" x 40" x 16' McDougall (used).
1—21" x 30" x 7' South Bend (used).
1—20" x 38" x 12' C.M.C. (used).

TURRET LATHES

No. 4 Millhollands, capacity 1½" (used).
Several Oliver & Davis Turrets, various capacities (used).

SHAPERS

1—16" "MacKenzie" B.G. Crank Shaper (new).
1—16" "Rae" B.G. Crank Shaper (slightly used).
1—24" "McGregor-Gurley" B.G. Crank Shaper (used).

PLANERS

1—42" x 42" x 20' Putnam, 1 head (used).
1—30" x 30" x 10' Pond, 1 head (used).
1—24" x 24" x 6' Powell, 1 head (new).

MILLING MACHINES

1—Briggs High Duty Type "A" 24" Traverse (new).
1—Briggs High Duty Type "B" 42" Traverse (new).
1—Whitney Hand Miller, 18" x 6" table (used).

DRILLS

2—10" Burke Sensitive (Bench type) (new).
1—15" Barnes (used).
20" "Sibley," "Champions," "Rockwell" and "Silver" (new) and (used).
1—36" C.M.C. Heavy Duty (used).
1—3-spindle 20" Silver Gang Drill (used).
1—4-spindle W. & R. Sensitive (used).

BORING MACHINES

1—66" Bement-Niles Vertical, 2 heads, 24" under rail (used).
1—Universal No. 2½ Horizontal Table, 42" x 22" (used).
1—Bullard "New Era" Vertical Turret, 36", complete equipment (new).

POWER HACK SAWS

1—No. 10 Racine 8" x 8" Cap. (new).
1—No. 7 Watkins 9" Cap., 2" Blade (used).
1—6" x 6" Racine (used).

AIR COMPRESSORS

1—12" x 12" Bury, Class "L," Belt driven (used).
1—8" x 8" Sullivan, Class W.G.-3, Belt driven (used).
1—8 x 10 x 8 Bury, Steam driven (used).
1—8" x 11½" x 8 American Steam Pump Co., motor driven (used).

MISCELLANEOUS

1—Brown-Boggs No. 200, Power Press (new).
1—Lennox Rotary Bevel Shear, 1" Cap. (new).
1—"High Speed" Hammer, No. 3A (used).
1—Beaudry Champion Power Hammer, No. 9 (used).
1—"Grant" Riveting Machine, No. 80A (used).
1—"Grant" Riveting Machine, No. 80B (new).
1—Arbor Press, No. 4 "Greenerd" (new).

GRINDING MACHINES

1—Landis No. 4 Universal (used).
1—Landis Plain, self-contained, 36" x 12" (used).
1—Norton Plain, No. 434 (used).
1—Fitchburg Cylindrical 8" x 36" (new).
Several Tool and Cutter Grinders (new) and (used). "Globe," "Stevens," "LeBlond" and "Cincinnati."

GARLOCK-WALKER MACHINERY CO., LIMITED

MONTREAL, 337 St. James St. TORONTO, 32 Front St. W. Warehouse: 163 Dufferin Street, Toronto WINNIPEG, 567 Banning Ave

CANADIAN MACHINERY wants a representative in every town and city where there is a metal working plant or large machine shop.

We require first of all the ability to demonstrate to mechanics the value of reading technical journals in general and CANADIAN MACHINERY in particular, and to secure their subscriptions.

Second—we want men who can tell news when they see it. Not necessarily men who can write, but men who are alert for news, and who will give us the facts, briefly and plainly.

We will pay you liberally if you can handle this work for us in your city.

Canadian Machinery and Manufacturing News

143 University Ave. Toronto, Ont.

ON THE LISTS OF ADMIRALTY, WAR OFFICE, CROWN AGENTS FOR COLONIES, ETC.

Manufacturers of
EXTRUDED BRASS and BRONZE RODS and SECTIONS.

HOT BRASS and BRONZE STAMPINGS and PRESSINGS.

GUN METAL, PHOSPHOR BRONZE, BRASS and WHITE METAL INGOTS.

CHILL CAST PHOSPHOR BRONZE BARS.

PHOSPHOR COPPER and PHOSPHOR TIN.

McKechnie Brothers, Ltd.

COPPER SMELTERS

BRASS ROD, STAMPINGS AND METAL MANUFACTURERS

ROTTON PARK STREET

BIRMINGHAM, ENGLAND

We stock in Montreal Free Turning Brass and Bronze Rods, suitable for high speed Turning both in Round and Hexagon.

We shall also be pleased to quote for shipments direct from Birmingham, shipping in two weeks' time.

Sole Canadian Agents:

Thomas Moore & Son

224 Lemoine Street, Montreal

We excel in quantity production

Classified Opportunities

We Have
Everything You Can Think Of
In
Mill and Shop Equipment

MACHINERY (Metalworking)

Lathes
Planers
Shapers
Milling Machines
Screw Machines
Boring Mills
Tinners' Tools
Drilling Machines
Arbor Presses
Blacksmiths' Tools
Grinding Machines
Electric Motors
Electric Tools
Riveting Hammers
Pipe Machines
Metal Cutting Machines
Air Compressors
Heat Treating Furnaces
Pumps—all kinds
Precision Machinery

MACHINERY (Woodworking)

Lathes
Planers
Borers
Jointers
Universal Woodworkers
Band Saws
Swing Saws
Moulders
Mortisers
Shapers
Knife Grinders
Saw Tables
Sanders
Wood Trimmers
Tenoners
Screw Driving Machines
Disc Grinders
Variety Saws
Dado Machines
Safety Devices

TOOLS and Shop Supplies

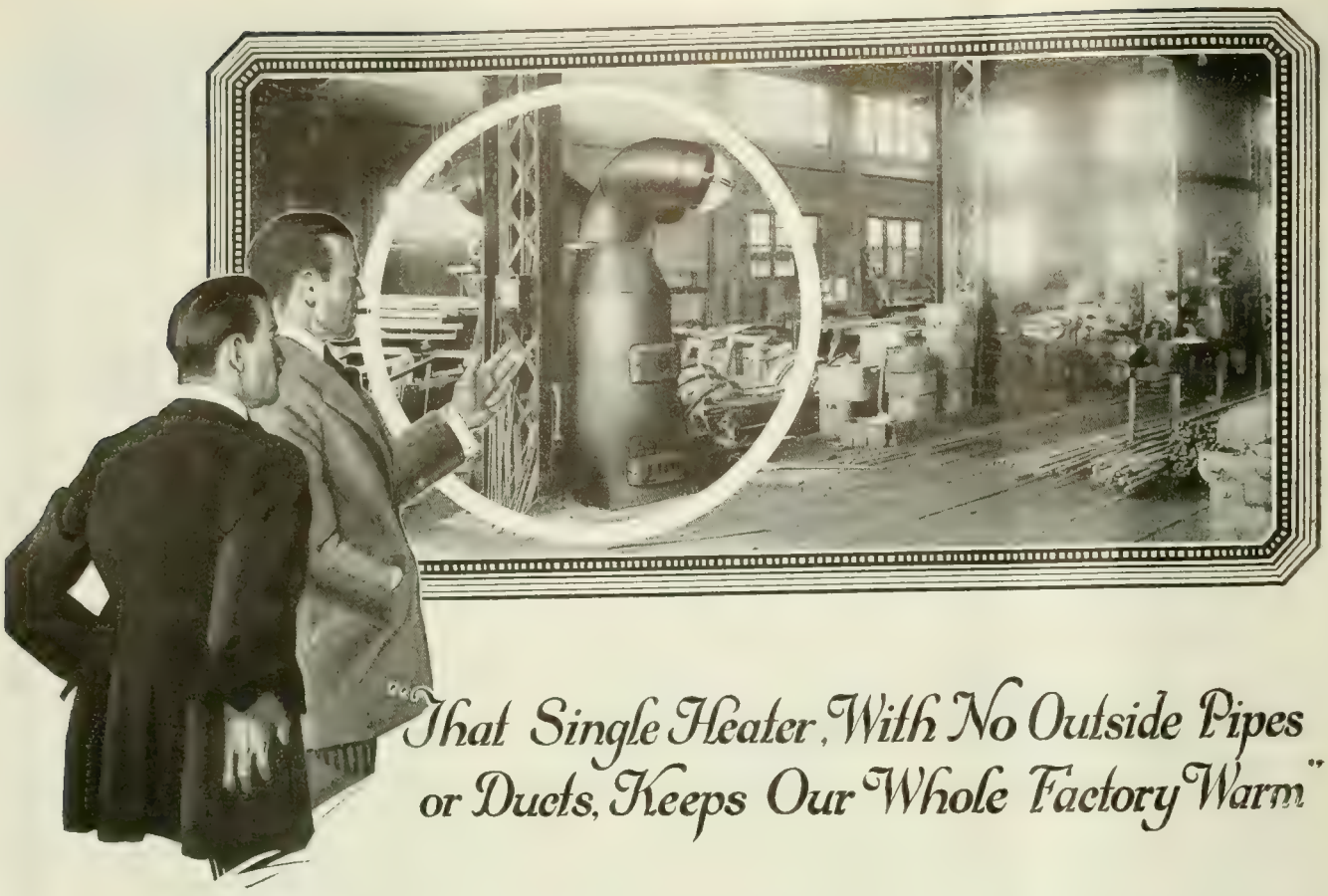
Small Tools—all kinds
Cutting and Welding Torches
Belting
Pulleys
Metals—all kinds
Wire Rope
Manilla Rope
Grinding Wheels
Gears
Taps and Dies
Chucks
Vises
Jacks
Hoists
Shop Furniture
Brooms
Bolts—Screws—Rivets
Precision Tools

THESE ARE ONLY A FEW OF THE MANY ITEMS WE HANDLE

Let us quote on your requirements

THE CHARLES A. STRELINGER CO.
OF CANADA, LIMITED

126 Ferry Street — Windsor, Ontario



"That Single Heater, With No Outside Pipes or Ducts, Keeps Our Whole Factory Warm"

"We've got all that open space out there—had all sorts of trouble keeping it warm. Naturally, I was a little bit skeptical until the Skinner Bros. salesman told me he would put in his heater on an absolute guarantee to keep all of the factory warm, all of the time—that if it failed we could return it and get back every dollar we paid. I told him to put it in. That was five years ago—since then we haven't had a bit of trouble—temperature is always right around 70 and we hardly ever run the heater more than three or four hours a day."

Simple in Principle

The Skinner Bros. (Baetz Patent) Heater is an individual enclosed unit, with a series of steam coils compactly mounted above a powerful fan wheel. Cold air near the floor level, or from outside, is drawn into the heater by the fan, forced up and around the coils, and, after being heated, is gently distributed through the outlet hoods into the open building space. Uses live or exhaust steam—where steam is not available, we supply our direct-fired type, which burns coal, coke or wood.

The heater is portable—requires no special foundation—installation cost is 15% to 50% lower than any other type—operating cost is equally low.

Find out more about this heater. If you wish, we will send you names of users so you can make your own investigations.

MECHANICAL DETAILS

Built as an individual enclosed unit with a series of pipe coils compactly mounted above a fan wheel, and heated by exhaust or live steam. Cold air near the floor level is drawn into the heater by the fan, impelled upward and around the coils, and, after being heated, distributed through outlet hoods to every part of the open building space.

Large illustration at top shows direct fired type D-F, fired with coal, coke or wood.

SKINNER BROS. MFG. COMPANY, Inc.

1438 S. Vandeventer Avenue, St. Louis, Mo.

New York, 1706 Flatiron Bldg.; Indianapolis, 330 Occidental Bldg.; Boston, 449 Little Bldg.; Minneapolis, 806 Metropolitan Life Bldg.; Buffalo, 706 Morgan Bldg.

Skinner Bros.
Baetz Patent HEATING SYSTEM

Skinner Bros. Mfg. Co., Inc.,
1438 S. Vandeventer Ave., St. Louis, Mo.

Please send complete details on Skinner Bros (Baetz Patent) Heaters to

Firm Name . . . . . .

Address . . . . . .

For what purpose building used . . . . . .

Can you use steam? . . . . . .

Canadian Machinery BUYERS DIRECTORY

If what you want is not here, write us, and we will tell you where to get it. Let us suggest that you consult also the advertisers' index—last page of book, after having secured advertisers' names from this directory. The information you desire may be found in the advertising pages. This department is maintained for the benefit and convenience of our readers. The insertion of our advertisers' names under proper headings is gladly undertaken, but does not become part of an advertising contract.

Abrasive Discs
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John London S E, Eng
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Abrasive Materials
Dom Abrasive Wheel Co., Ltd., Montreal, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Acetylene, Dissolved
L'Air Liquide Society, Toronto, Ont.

Accumulators, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Air Lifts
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Air Purifiers and Coolers
Sturtevant Co., B. F., Boston, Mass.

Analyses, Chemical
Toronto Testing Laboratory, Toronto, Ont.

Angle Bars
Steel Co. of Canada, Ltd., Hamilton, Ont.

Anvils
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Columbia Hdwe. Division, Cleveland, O.
Petrie, Ltd., H. W., Toronto, Ont.

Arbors
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.
Cleveland Twist Drill Co., Cleveland, O.
Ford-Smith Machine Co., Hamilton, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.

Axles, Car
Dom. Foundries & Steel, Hamilton, Ont.

Babbitt Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Taliman Brass & Metal Co., Hamilton, Ont.

Balls, Brass, Bronze and Steel
Canada Foundries & Forgings Co., Welland, Ont.
Canadian SKF Co., Toronto, Ont.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Barrels, Tumbling
Baird Machine Co., Bridgeport, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Bars, Boring
Armstrong Bros. Tool Co., Chicago, Ill.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis
Madison Mfg. Co., Muskegon, Mich.

Bars, Boring, Portable
Underwood Corp., H. B., Philadelphia, Pa

Bars, Bronze Cored
Moore & Son, Thos., Montreal, Que.
Taliman Brass & Metal Co., Hamilton, Ont.

Bars, Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bars, Steel
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Armstrong-Whitworth of Canada, Ltd Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Pilot Steel & Tool Co., Montreal, Que.
Steel Co of Canada, Ltd., Hamilton, Ont
United Alloy Steel Corp., Canton, Ohio.
Vanadium Alloys Steel, Latrobe, Pa.

Bearings, Ball
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Bronze
Taliman Brass & Metal Co., Hamilton, Ont.
Railway Roller Bearing Co., Syracuse, N.Y.

Bearings, Die-Cast
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Taliman Brass & Metal Co., Hamilton, Ont.

Bearings, Journal
Fisher Motor Co., Ltd., Orillia, Ont.
Taliman Brass & Metal Co., Hamilton, Ont.

Bearings, Roller
Lang Mfg. Co., Guelph, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Railway Roller Bearing Co., Syracuse, N.Y.

Belt Cement
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.

Belt Clamps
Graton & Knight Mfg Co., Worcester, Mass.

Belt Dressings and Fillers
Aikenhead Hardware Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.

Belt Fasteners
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Belt Lacing
Clipper Belt Lacer Co., Grand Rapids, Mich.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co, J C., Montreal, Que.

Belt Lacing, Steel
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Hinged
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing, Flexible Steel
Flexible Steel Lacing Co., Chicago, Ill.

Belt Lacing Machines
Clipper Belt Lacer Co., Grand Rapids, Mich
Federal Eng'r'ng Co., Ltd., Toronto, Ont
McLaren Belting Co., J. C., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Belt Joiners, Conveyor
Flexible Steel Lacing Co., Chicago, Ill.

Belt Tools
Graton & Knight Mfg. Co., Worcester, Mass

Belting, Chain
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que
Lyman Tube & Supply Co., Montreal, Que
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Belting, Fabric
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Dom. Belting Co., Ltd., Hamilton, Ont.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Foss Machinery & Supply Co., Geo. E., Montreal, Que.
McLaren Belting Co, J. C., Montreal, Que.
Sumner & Co., New York City

Belting, Leather
Atkins & Co., Inc., E. C., Indianapolis, I.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Smith Belting Co., Toronto, Ont.
Sumner & Co., New York City.
Tullis & Son, Ltd., John, Glasgow, Scot.

Belting, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Gutta Percha & Rubber, Toronto, Ont.
Quaker City Rubber Co., Philadelphia, Pa.

Belts, Abrasive
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Oakey & Sons, Ltd., John, London, S.E., Eng.

Bench Countershaft Standards
Ford-Smith Machine Co., Hamilton, Ont

Benches, Work
Aikenhead Hardware Ltd., Toronto, Ont.

Bending Machines, Power
Bertram & Son Co., Ltd, The John, Dundas, Ont.
Bertrams Ltd., Edinburgh, Scotland.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Bins, Ore
MacKinnon Steel Co., Sherbrooke, Que.

Blocks
Ford Chain Block Co., Philadelphia, Pa.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Chain (See Hoists, Hand)
Aikenhead Hardware Ltd., Toronto, Ont.
Ford Chain Block Co., Philadelphia, Pa
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Blocks, Die
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Swedish Crucible Steel Co of Canada Ltd., Windsor, Ont.

Blocks, Pillow
Can. Link-Belt Co., Toronto, Ont.

Blowers
Can. Blower & Forge Co., Ltd., Kitchener.
General Combustion Co. of Can., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Bolt and Nut Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
National Machinery Co., Tiffin, Ohio
Victor Tool Co., Waynesboro, Pa.

Bolt and Nut Machinery, Automatic
National Acme Co., Cleveland, Ohio.

Bolts and Nuts
London Bolt & Hinge Works, London, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Petrie, Ltd., H. W., Toronto, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Bolt Threading Die Heads
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa

Boosters
Sturtevant Co., B. F., Boston, Mass

Boring and Turning Mills, Vertical
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy Co., Toronto, Ont
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont

Boring, Drilling and Milling Machines, Horizontal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Landis Tool Co., Waynesboro, Pa

Boring, Drilling and Milling Mach., Vertical
Armstrong-Whitworth of Canada Ltd., Montreal, Canada
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Boring Heads
Aikenhead Hardware Ltd., Toronto, Ont.

Boring Tools
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Armstrong Bros. Tool Co., Chicago, Ill.
Gisholt Machine Co., Madison, Wis

Brakes, Magnetic (for electric furnaces)
Volta Mfg. Co., Welland, Ont.

Brass
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.

Bricks, Fire
Elk Firebrick Co. of Can., Ltd., Hamilton, Ont.

Bridges
Hamilton Bridge Works Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que

Broaching Machines
Bilton Machine Co., Bridgeport, Conn
Garlock-Walker Mchy. Co., Toronto, Ont

Bronze
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Bronze, Phosphor
British Smelting & Refining Co., Ltd., Montreal, Que.
Canada Metal Co., Ltd., Toronto, Ont.

Bucket Carriers, Pivoted
Can. Link-Belt Co., Toronto, Ont

Buffing or Polishing Machines (See Polishing and Buffing Machines)
Blount Co., J. G., Everett, Mass.
Can Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.
U S Electrical Tool Co., Cincinnati, O

Bulldozers
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Burners, Oil and Gas
General Combustion Co. of Can., Ltd., Montreal, Que.
Rockwell Co., W S., New York City.

Bushings
Fisher Motor Co., Ltd., Orillia, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Cabinets, Oil
S. F. Bowser & Co., Ltd., Toronto, Ont.

Calipers
Brown & Sharpe Mfg Co., Providence, R I.
Starrett Co., L. S., Athol, Mass.

Cams
Canada Foundries & Forgings Co., Welland, Ont.

Can-Making Machinery (See Sheet Metal Working Machinery
Bliss Co., E W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Cars, Ore
MacKinnon Steel Co., Sherbrooke, Que

Castings, Aluminum
Canada Electric Castings Co. Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Brass and Bronze
Algoma Steel Corp., Ltd., Sault Ste Marie, Ont.
Canada Electric Castings Co., Ltd., Orillia
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Copper
Can. Hanson & Van Winkle Co., Toronto, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Marine
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Castings, Die Molded
Fisher Motor Co., Ltd., Orillia, Ont.
Franklin Die-Casting Corp., Syracuse, N.Y.
Katie Foundry Co., Galt, Ont.
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Ferro-Alloy
Can. Steel Foundries, Montreal, Que

Castings, Iron
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Bernard Industrial Co., A., Fortierville, Que.
Bilton Machine Co., Bridgeport, Conn.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Hanson & Van Winkle Co., Toronto, Ont.
Canada Electric Castings Co., Ltd., Orillia
Hanna & Co., M. A., Cleveland, Ohio
Hepburn Ltd., John T., Toronto, Ont.
Katie Foundry Co., Galt, Ont.
Kennedy & Sons, Wm., Owen Sound, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Hyd. Press
Can. Steel Foundries, Montreal, Que.

Castings, Monel Metal
Can. Driver-Harris Co., Ltd., Walkerville, Ont.

Castings, Naval Bronze
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Castings, Nichrome
Can. Driver-Harris Co., Walkerville, Ont.
Electric Steel & Engineering Co., Welland, Ont.
Hull Iron & Steel Foundries, Hull, Que
Katie Foundry Co., Galt, Ont
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Castings, Nickel
Can. Hanson & Van Winkle Co., Toronto, Ont.

Castings, Semi-Steel
Davidson Mfg. Co., Thos., Montreal Que
Hull Iron & Steel Foundries, Hull, Que.
Katie Foundry Co., Galt, Ont
Manitoba Steel Foundries, Ltd., Winnipeg, Man.

Castings, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Can. Steel Foundries, Montreal, Que
Kennedy & Sons, Wm., Owen Sound, Ont.
Swedish Crucible Steel Co. of Can., Ltd., Windsor, Ont.

Cements, Iron
Sterling Mfg. Co., Jersey City, N.J.

Centering Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.

Chains (See Sprockets and Chains)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Morse Chain Co., Ithaca, N.Y.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Weldless Link Co., Lisbon, Ohio

Chains, Driving
Can. Link-Belt Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Glassco, Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.
Wright Mfg. Co., Lisbon, Ohio.

Chasers
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chemicals
Anderson, Limited, Robertson, Toronto, Ont.

Chucking Machines
Acme Machine Tool Co., Cincinnati, Ohio
Brown & Sharpe Mfg. Co., Providence, R.I.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Chucks, Drill
Jacobs Mfg. Co., Hartford, Conn.

Chucks, Drill and Tap
Aikenhead Hardware Ltd., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Lathe
Aikenhead Hardware Ltd., Toronto, Ont.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Dom. Steel Products Co., Brantford, Ont.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Gisholt Machine Co., Madison, Wis.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.
Williams & Wilson, Ltd., Montreal, Que.

Chucks, Magnetic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Chucks, Planer
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Chucks, Vertical Boring Mill
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Skinner Chuck Co., New Britain, Conn.
Union Mfg. Co., New Britain, Conn.

Clamps, Machinists'
Columbia Hilwe Division, Cleveland, O.
Dickow, Fred C., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Cleaners, Metal, Waste, General
Oakley Chemical Co., New York, N.Y.

Clocks, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Clutches, Friction
Bernard Industrial Co., A., Fortierville, Que.
Can. Link-Belt Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Positive Clutch & Pulley Works, Toronto, Ont.

Coal and Ash Handling Machinery
Can. Ingersoll Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Coal-Storage Systems
Can. Link-Belt Co., Toronto, Ont.

Collars, Shaft or Set
Canada Foundries & Forgings Co., Welland, Ont.
Can. Link-Belt Co., Toronto, Ont.

Collets
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Canada Machinery Corp., Galt, Ont.
Bilton Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Compounds, Carburizing, Case Hardening and Tempering
Cataract Refining Co., Toronto, Ont.

Compounds, Cleaning
Canada Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compounds, Cutting, Drilling, Grinding, Screw Cutting
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Cataract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Compressors, Air
Canadian Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Compressors, Air and Gas
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.

Cones, Friction
Norton Co. of Can., Ltd., Hamilton, Ont.

Connecting Rods and Straps
Canada Foundries & Forgings Co., Welland, Ont.

Contract Work
Ford-Smith Machine Co., Hamilton, Ont.
Smith Bros. Mfg. Co., Ltd., St. Louis, Mo.
Victoria Foundry Co., Ltd., Ottawa, Ont.

Conveyors and Elevators (See Elevators)
Jones & Glassco, Montreal, Que
Main Belting Co. of Can., Montreal, Que.
Mathews Gravity Carrier Co., Port Hope, Ont.

Conveyor Belt Joiners
Flexible Steel Lacing Co., Chicago, Ill

Copper
Brown's Copper & Brass Rolling Mills Ltd., Toronto, Ont.

Cored Bronze Bars
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Cotter Pins
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont

Counterbores
Cleveland Twist Drill Co., Cleveland, O.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Counters, Revolution
Aikenhead Hardware Ltd., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Countershafts
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.

Countersinks
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Couplers, Car and Locomotive
Can. Steel Foundries, Montreal, Que.

Couplings, Flexible
Holden Co., Ltd., Montreal, Que.

Couplings, Rigid
Bernard Industrial Co., A., Fortierville, Que.

Couplings, Shaft
Bilton Machine Co., Bridgeport, Conn.
Can. Link-Belt Co., Toronto, Ont.

Cranes, Electric
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.

Cranes, Hand (See Hoists, Hand)
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.

Cranes, Locomotive
Can. Link-Belt Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Cranes, Traveling
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Hepburn Ltd., John T., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Crank Pin Turning Machines
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Underwood Corp., H. B., Philadelphia, Pa.

Cutters, Flue
Holden Co., Ltd., Montreal, Que.

Cutters, Gear
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, High Speed
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, Ind.
Bilton Machine Co., Bridgeport, Conn.
Butterfield & Co., Inc., Rock Island, Que.
Eclipse Counterbore Co., Ltd., Walkerville, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Madison Mfg. Co., Muskegon, Mich.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Milling
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Milling Machine Co., Cleveland.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pilot Steel & Tool Co., Montreal, Que.

Cutters, Stay Bolt
Acme Machinery Co., Cleveland, Ohio.
Landis Machine Co., Inc., Waynesboro, Pa
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Cutters, Thread
Butterfield & Co., Inc., Rock Island, Que
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa

Cutting-Off Machines
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass.

Cutting-Off Machines, Pipe (See Pipe Cutting and Threading Machines)
Landis Machine Co., Inc., Waynesboro, Pa
McDougall Co., Ltd., R., Galt, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Cutting-Off Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Armstrong Bros. Tool Co., Chicago, Ill.
Pilot Steel & Tool Co., Montreal, Que.

Cutting Oil Filters (See Oil Filtering Systems)
Ernest N. Lee & Co., Ltd., Toronto, Can.
Cataract Refining Co., Toronto, Ont.

Cutting, Oxy-Acetylene
Carter Welding Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Perraue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont
Turner Brass Works, Sycamore, Ill.
Union Carbide Co. of Can., Welland, Ont.

Cutting, Oxy-Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Dealers, Machinery (See Searchlight Section)
Ford-Smith Machine Co., Hamilton, Ont
Petrie, Ltd., H. W., Toronto, Ont.

Deckle Straps
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Diamonds, Black and Rough
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond, Carbon and Bortz
Joyce-Koebel Co., Inc., New York, N.Y.

Diamond Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Geometric Desmond-Stephan Co., Hamilton, Ont.
Ideal Screw Machine Co., Hamilton, Ont.
Wheel Trueing Tool Co., Detroit, Mich.

Diamond Crossings
Can. Steel Foundries, Montreal, Que.

Die-Castings
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Dies, Pipe-Threading
Jones & Lamson Machine Co., Springfield, Vt.

Die Sinking Machines, Automatic
Lamson & Sessions Machine Co., Springfield, Vt.
Lucas Co., Jackson, Mich.

Die Sinkers
Kimber & Hillier, St. Catharines, Ont.

Dies, Screw and Thread Cutting
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Hanna & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa
Murchey Machine & Tool Co., Detroit.
National Acme Co., Cleveland, Ohio

Dies, Sheet-Metal and Sub-Press (See Tool Work)
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

MADE IN CANADA

MALLEABLE AND CAST IRON PIPE FITTINGS

Quality Products

Annual Capacity 6000 Tons

Prompt Service

M Brand Pipe Fittings, Screwed or Flanged, Black or Galvanized.

We are equipped to make the general run of malleable and grey iron castings for machinery manufacturers, agricultural implements, automobiles and specialties.

Cast Iron Fittings

stamped with our trade-mark mean fittings made with iron of high tensile strength — proper proportions and correct tappings.

RECESSED DRAINAGE FITTINGS

Malleable Fittings

of our brand mean fittings made of *Air Furnace Refined Iron,* reamed and tapped to gauge with perfect threads.

A trial of our pipe fittings will prove the quality of service they give.

International Malleable Iron Company, Limited
GUELPH, CANADA

Representatives:
Halifax—GEO. D. HATFIELD, Bedford Chambers
St. John, N.B.—H. G. ROGERS, 147 Prince William St.
Winnipeg—HARRY F. MOULDEN, Confederation Life Building
Vancouver, B.C.—CYRIL AMES, Wilton Block
Montreal and Toronto—From Head Office, Guelph, Ont.

Sweeney and Reginald

SWEENEY the quick-footed, quick-thinking, rugged iron worker and Reginald the pride of the parlor are off—where's your money?

And yet you employ "Reginalds" to do your high speed reaming—pretty pedigreed reamers, expensive and brittle as a match—when high speed reamers with all the burly strength and speed of *"Sweeney"* are yours for the asking.

The ordinary high speed reamer *must* be both brittle and expensive, for the big, bulky body is the very *last* place that brittle high speed steel should be used in a reamer.

PEERLESS HIGH SPEED REAMERS

Peerless High Speed Reamers are the "Sweeney's" of reamerdom—tough, gluttons for punishment, yet high speed from tip to toe. Peerless bodies are of a special tough alloy chosen especially to withstand shocks and tortional strains.

Peerless blades, however, are of high speed stock selected and treated to develop every ounce of the cutting capacity peculiar to high speed steel. Blades and body are then eternally united by a patented proeess called "Brazo-Hardening."

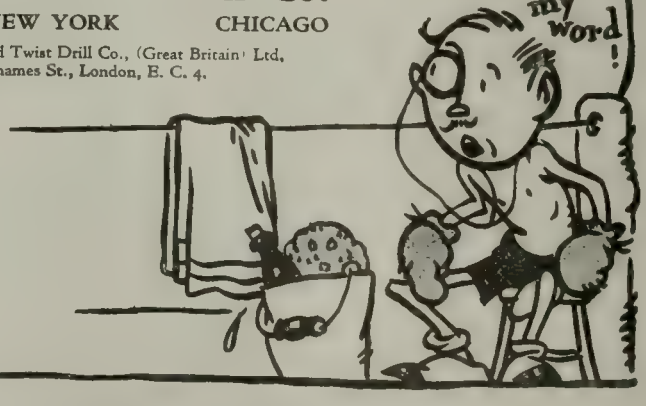
The result is a burly, a rugged high speed reamer that can fight through a 20 round "go" and be ready for more—the sort of high speed reamer that is ready to tackle any job in your shop requiring speed and punch and endurance— the sort of job that *stumps* the ordinary high speed reamer is the sort of job "Peerless" is used to—

We Invite You to Try to Stump "Peerless"
With the Toughest Job in Your Shop.

The Cleveland Twist Drill Co.

CLEVELAND NEW YORK CHICAGO

Agents for Europe, Cleveland Twist Drill Co., (Great Britain) Ltd.
36-37 Upper Thames St., London, E. C. 4.



BUYERS' DIRECTORY

Dies, Forging
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Kimber & Hillier Mfg. Co., St. Catharines, Ont.

Dies, Hammer
Kimber & Hillier, St. Catharines, Ont.

Dies, Self-Opening, Adjustable
Geometric Tool Co., New Haven, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Prest-O-Lite Co. of Can., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Dies, Threading-Opening
Jardine & Co., A. B., Hespeler, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Landis Machine Co., Inc., Waynesboro, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Disc Cement
Ritchey Supply Co., Toronto, Ont.
Wausau Abrasives Co., Chicago, Ill.

Dividing Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Dickow, Fred. C., Machinery Co., Chicago, Ill.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Dogs, Lathe and Milling Machine
Armstrong Bros. Tool Co., Chicago, Ill.

Drafting Boards and Tables
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Drafting Materials
American Lead Pencil Co., New York City, N.Y.
Darling Bros., Ltd., Montreal, Que.
Economy Drawing Table & Mfg. Co., Adrian, Mich.
Hughes Owens Co., Ltd., Montreal, Que.

Dressers, Grinding Wheel
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont
Ford-Smith Machine Co., Hamilton, Ont.
Joyce-Koebel Co., Inc., New York, N.Y.
Norton Co. of Can., Ltd., Hamilton, Ont.
Oliver Machy. Co., Grand Rapids, Mich

Drill Holders
Armstrong Bros. Tool Co., Chicago, Ill.

Drill Rods
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Aikenhead Hardware Ltd., Toronto, Ont
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Drill Speeders
Canada Machinery Corp., Galt, Ont.

Drilling Machine Heads
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill.
United States Machine Tool Co., Cincinnati, Ohio.

Drilling Machines, Automatic
Hoosier Drilling Mach. Co., Goshen, Ind.
National Automatic Tool Co., Richmond, Ind.

Drilling Machines, Bench
Beacon Engineering Co., Tipton, England.
Can. Blower & Forge Co., Ltd., Kitchener.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng.
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Electric and Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Foss Machinery & Supply Co., Geo. F., Montreal Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Gang
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drilling Machines, Heavy Duty
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Hoosier Drilling Mach. Co., Goshen, Ind.
Rockford Lathe & Drill Co., Rockford, Ill.

Drilling Machines, Horizontal (See Boring, Drilling and Milling Machines, Horizontal)
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis
Holly R. S., Toronto, Ont.
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill

Drilling Machines, Multiple Spindle
Beacon Engineering Co., Tipton, England
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Hoefer Mfg. Co., Freeport, Ill
National Acme Co., Cleveland, Ohio
National Automatic Tool Co., Richmond, Ind
Terry & Co., John C., Birmingham, Eng

Drilling Machines, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.

Drilling Machines, Portable
Holden Co., Ltd., Montreal, Que
Independent Pneumatic Tool, Chicago, Ill.
Jardine & Co., A. B., Hespeler, Ont.
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Radial
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo F., Montreal Que
Garlock-Walker Mchy. Co., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Drilling Machines, Sensitive
Beacon Engineering Co., Tipton, England.
Bilton Machine Co., Bridgeport, Conn.
Henry & Wright Mfg. Co., Hartford, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Hoosier Drilling Mach. Co., Goshen, Ind.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont
Rockford Drilling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng
United States Machine Tool Co., Cincinnati, Ohio.
Williams Machinery Co., A. R., Toronto, Ont
Wisconsin Electric Co., Racine, Wis.

Drilling Machines, Turret
Gisholt Machine Co., Madison Wis
Steinle Turret Machine Co., Madison, Wis
Williams Machinery Co., A. R., Toronto, Ont.

Drilling Machines, Vertical
Aurora Tool Works, Aurora, Ind
Bertram & Son Co., Ltd., The John, Dundas, Ont
Canada Machinery Corp., Galt, Ont
Can. Blower & Forge Co., Ltd., Kitchener
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Hoefer Mfg. Co., Freeport, Ill
Hoosier Drilling Mach. Co., Goshen, Ind
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont
Rockford Drilling Machine Co., Rockford, Ill
Rockford Lathe & Drill Co., Rockford, Ill
Perfect Machine Co., Ltd., Galt, Ont.
Terry & Co., John C., Birmingham, Eng.
Yinger Co. of Can., Ltd., Chas. A., Windsor, Ont.

Drills, Center
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Drills, High Speed Twist
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que
Butterfield & Co., Inc., Rock Island, Que
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal Que
Garlock-Walker Mchy. Co., Toronto, Ont
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Lyman Tube & Supply Co., Montreal, Que
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Sheffield Engineering Supplies, Ltd., Montreal, Que.
Sheffield Twist Drill & Steel Co., Sheffield, Eng.

Drills, Ratchet
Armstrong Bros. Tool Co., Chicago, Ill.
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Drills, Twist and Flat
Butterfield & Co., Inc., Rock Island, Que.
Cleveland Twist Drill Co., Cleveland, O
Can. Detroit Twist Drill Co., Walkerville, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.

Dust Handling Equipment
Can. Blower & Forge Co., Ltd., Kitchener.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Electrical Instruments
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Electrical Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.
U.S. Electrical Tool Co., Cincinnati, O.

Elevating Trucks (See Trucks)
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Elevators and Conveyors
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Main Belting Co. of Can., Montreal, Que
Mathews Gravity Carrier Co., Port Hope, Ont.

Emery Wheels (See Grinding Wheels)
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co. of Canada, Ltd., Brantford, Ont.

Engines, Capstan
Kennedy & Sons, Wm., Owen Sound, Ont

Engineers, Mechanical
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Gear & Machine Co., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.

Expanders, Tube
Garlock-Walker Mchy. Co., Toronto, Ont
Holden Co., Ltd., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Eyeglasses, Safety (See Goggles, Safety)
Prest-O-Lite Co. of Can., Toronto, Ont.
Willson Goggles, Inc., Reading, Pa.

Fans, Electric
Can. Blower & Forge Co., Ltd., Kitchener
Northern Electric Co., Montreal, Que.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Exhaust
Can. Blower & Forge Co., Ltd., Kitchener.
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fans, Ventilating
Can. Blower & Forge Co., Ltd., Kitchener
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que
Petrie, Ltd., H. W., Toronto, Ont.
Skinner Bros. Mfg. Co., Inc., St. Louis, Mo.
Sturtevant Co., B. F., Boston, Mass.

Fibre
Diamond State Fibre Co., Toronto, Ont.
Northern Electric Co., Montreal, Que.

File Handles
Ingersoll File Co., Ltd., Ingersoll, Ont.

Files and Rasps
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo F., Montreal, Que.
Ingersoll File Co., Ltd., Ingersoll, Ont
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Nicholson File Co., Port Hope, Ont
Simonds Canada Saw Co., Montreal, Que

Filing Machines
Gardner Machine Co., Toronto, Ont
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que

Filler, Iron (See Cements, Iron)
Smooth Mfg. Co., Jersey City, N.J.

Fire Extinguishers
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Fittings, Pipe
International Malleable Iron Co., Guelph, Ont

Flexible Shafts
Aikenhead Hardware Ltd., Toronto, Ont.

Flux, Galvanizing
British Smelting & Refining Co., Ltd., Montreal, Que.

Fluxes, Welding
L'Air Liquide Society, Toronto, Ont.

Forging Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
National Machinery Co., Tiffin, Ohio.
Stewart & Co., Duncan, Glasgow, Scot.

Forgings, Drop
Canada Foundries & Forgings Co., Welland, Ont.
Dominion Forge & Stamping Co., Ltd., Toronto, Ont.

Forgings, Hammer
Armstrong Whitworth of Canada, Ltd., Montreal, Canada.
Canada Foundries & Forgings Co., Welland, Ont
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Hepburn Ltd., John T., Toronto, Ont.
N. S. Steel Co., Ltd., New Glasgow, N.S.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Foundry Equipment
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Foundry Supplies
Atkins & Co., Inc., E. C., Indianapolis, I.
Rice Lewis & Son, Ltd., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Frogs, Spring or Rigid
Can. Steel Foundries, Montreal, Que.

Fuel Oil Burning System
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Electric
Electric Furnace Construction Co., Philadelphia, Pa.
General Combustion Co. of Can., Ltd., Montreal, Que.

Furnaces, Heat Treating Coal
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.

Furnaces, Heat Treating Oil and Gas
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bellevue Industrial Furnace Co., Detroit.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furnaces and Ovens, Electric
Electric Furnace Construction Co., Philadelphia, Pa
Petrie, Ltd., H. W., Toronto, Ont.
Volta Mfg. Co., Welland, Ont.
Walker & Sons Metal Products, Ltd Hiram, Walkerville, Ont.

Furnaces, Tempering and Annealing
Brown & Sharpe Mfg. Co., Providence, R.I.
Electric Furnace Construction Co., Philadelphia, Pa.
Mechanical Engineering Co., Three Rivers, Que.
Rockwell Co., W. S., New York City.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Furniture, Machine Shop
Garlock-Walker Mchy. Co., Toronto, Ont.

Gages, Comparator
Jones & Lamson Machine Co., Springfield, Vt.
Herbert Ltd., Alfred, Toronto, Ont.
Johansson Inc., C. E., Windsor, Ont.
Perdue, W. B., San Francisco, Calif.
Starrett Co., L. S., Athol, Mass.

Gages, Measuring (See Tool Work)
Chesterman & Co., Ltd., J., Sheffield, Eng.
Crescent Machine Co., Ltd., Montreal, Q.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co., L. S., Athol, Mass.

Gages, Recording
Bristol Co., Waterbury, Conn.
Johansson Inc., C. E., Windsor, Ont.

BUYERS' DIRECTORY

Gages, Snap, Thread and Cylindrical
Ackworthie, Ltd., John, Birmingham, Eng
Brown & Sharpe Mfg Co., Providence, R I.
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C E, Windsor, Ont.
Pratt & Whitney Co, of Canada, Ltd., Dundas, Ont.

Gages, Special Measuring (See Tool Work)
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co, of Canada, Ltd., Dundas, Ont.

Gages, Standard
Armstrong Whitworth Co. of Can., Lt Montreal, Que.
Atkins & Co, Inc, E. C., Indianapolis.
Johansson Inc, C. E., Windsor, Ont

Gages, Thread
Ackworthie, Ltd., John, Birmingham, Eng
Greenfield Tap & Die Corp., Galt, Ont.
Johansson Inc., C. E., Windsor, Ont
Starrett Co, L S., Athol, Mass.

Garnet, Emery and Flint Paper and Cloth
Ritchey Supply Co, Toronto, Ont

Gas, Coal Compressed
L'Air Liquide Society, Toronto, Ont

Gas, Compressed
Prest-O-Lite Co. of Can., Toronto, Ont.

Gaskets
Diamond State Fibre Co. of Can., Ltd, Toronto, Ont.
Dunlop Tire & Rubber Goods Co, Ltd, Toronto, Ont.
Goodyear Tire & Rubber Co of Can, Ltd., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Smooth Mfg. Co, Jersey City, N.J.

Gear Blanks
Canada Foundries & Forgings Co., Welland, Ont.
Can. Steel Foundries, Montreal, Que.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Foundries & Steel, Hamilton, Ont.
Hamilton Gear & Machine Co, Toronto, Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear-Cutting Machines
Bertram & Son Co, Ltd, The John, Dundas, Ont.
Bilton Machine Co., Bridgeport, Conn.
Brown & Sharpe Mfg. Co., Providence, R I.
Fellows Gear Shaper Co., Springfield, Vt.
Petrie, Ltd., H. W., Toronto, Ont.
Whiton Machine Co., D. E., New London, Conn.

Gear Testing Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Gears, Cast
Can. Link-Belt Co., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hull Iron & Steel Foundries, Hull, Que.

Gears, Cut
Brown & Sharpe Mfg. Co., Providence, R.I.
Canadian SKF Co., Toronto, Ont.
Crescent Machine Co., Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Dominion Bridge Co., Ltd., Lachine, Que.
Dom. Steel Products Co., Brantford, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Gardner & Son, Robt., Montreal, Que.
Hamilton Gear & Machine Co., Toronto, Ontario.
Hepburn Ltd., John T., Toronto, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
McDougall Co., Ltd., R., Galt, Ont.
Philadelphia Gear Works, Philadelphia, Pa.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Gears, Dressed
Kennedy & Sons, Wm., Owen Sound, Ont.

Gears, Forged
Canada Foundries & Forgings Co., Welland, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Gears, Herringbone
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.
Philadelphia Gear Works, Philadelphia, Pa.

Gears, Machine Moulded
Can. Steel Foundries, Montreal, Que.

Gears, Rawhide (See Gears, Cut)
Hamilton Gear & Machine Co., Toronto Ontario.
Philadelphia Gear Works, Philadelphia, Pa.

Gear, Silent Chain
Gardner & Son, Robt., Montreal, Que.
Morse Chain Co, Ithaca, N.Y.
Can. Link-Belt Co, Ltd, Toronto, Can
Hans Renold of Canada, Ltd., Montreal, Quebec.

Gears, Worm
Dom. Steel Products Co., Brantford, Ont.
Hamilton Gear & Machine Co., Toronto, Ontario.

Generators, Acetylene
L'Air Liquide Society, Toronto, Ont.

Generators, Electric
Canadian Westinghouse Co., Montreal, Que
Northern Electric Co. Montreal, Que.
Petrie, Ltd, H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass.

Goggles, Safety
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont
Standard Optical Co, Geneva, N.Y.
Willson Goggles, Inc., Reading, Pa.

Grab Buckets
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Dominion Bridge Co, Ltd., Lachine, Que
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.

Grease Cups, Pressed Steel and Brass
Can. Winkley Co., Ltd., Windsor, Ont.

Greases, Lubricating
Canadian SKF Co., Toronto, Ont.
Cateract Refining Co., Toronto, Ont.

Grinding Discs
Ritchey Supply Co., Toronto, Ont.

Grinding Machines
Brown & Sharpe Mfg. Co., Providence, R I

Grinding Machines, Abrasive Belt
Beacon Engineering Co., Tipton, England.
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Automatic
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Bench
Aikenhead Hardware Ltd., Toronto, Ont.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Holly, R. S., Toronto, Ont.
La Salle Tool Co., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa
Morse Twist Drill & Machine Co., New Bedford, Mass.
McDougall Co., Ltd., R., Galt, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Drilling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.
Terry & Co., John C., Birmingham, Eng.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wilkinson & Kompass, Hamilton, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Grinding Machines, Center
U.S. Electrical Tool Co., Cincinnati, O.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines Chaser
Jones & Lamson Machine Co, Springfield, Vt.

Grinding Machines, Cutter and Reamer
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Cylindrical
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Machine Co., Greenfield, Mass.
Pratt & Whitney Co, of Canada, Ltd., Dundas, Ont.

Grinding Machines, Die
Jones & Lamson Machine Co., Springfield, Vermont.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ont.

Grinding Machines, Disc
Beacon Engineering Co., Tipton, England.
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Drill
Beacon Engineering Co., Tipton, England.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Face
Ford-Smith Machine Co., Hamilton, Ont.

Grinding Machines, Floor and Tool
Beacon Engineering Co., Tipton, England.
Blount Co., J. G., Everett, Mass.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Modern Tool Co., Erie, Pa.
National Acme Co., Cleveland, Ohio.
Petrie, Ltd., H. W., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Grinding Machines, Internal
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.

Grinding Machines, Portable
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cincinnati Electrical Tool Co., Cincinnati, Ohio.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto Ont
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Power Oscillating Tool
Herbert Ltd., Alfred, Toronto, Ont.

Grinding Machines, Ring Wheel
Ford-Smith Machine Co., Hamilton, Ont

Grinding Machines, Snagging
Blount Co, J G, Everett, Mass
Norton Co. of Can., Ltd., Hamilton, Ont.

Grinding Machines, Surface
Garlock-Walker Mchy. Co., Toronto, Ont.
La Salle Tool Co., Ltd., La Salle, Ill.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Grinding Machinery, Tool Post
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Gisholt Machine Co., Madison, Wis.
Wisconsin Electric Co., Racine, Wis.

Grinding Machines, Universal
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
La Salle Tool Co., Ltd., La Salle, Ill.
Landis Tool Co., Waynesboro, Pa.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Petrie, Ltd., H. W., Toronto, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Waltham Grinding Wheel Co. of Canada, Brantford, Ont.

Grinding Wheels
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Dom. Abrasive Wheel Co., Ltd., Mimico, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Norton Co. of Can., Ltd., Hamilton, Ont.
Waltham Grinding Wheel Co of Canada, Ltd., Brantford, Ont.

Guards, Machinery and Window
Can. Wire & Iron Goods Co., Hamilton, Ont.

Guards, Electric Lamp
Flexible Steel Lacing Co., Chicago, Ill.

Gun-Barrel Machinery
Steinle Turret Machine Co., Madison, Wis.

Hack Saws, Power
Ackworthie, Ltd., John, Birmingham, Eng.
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Hamilton, Canada.
Garlock-Walker Mchy. Co., Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hammers, Chipping
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hammers, Drop
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Canada Machinery Corp., Galt, Ont.

Hammers, Electric
Aikenhead Hardware Ltd., Toronto, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Hammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Hammers, Power
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hammers, Riveting
Cleveland Pneumatic Tool Co., Toronto, Ont.

Hangers, Shafting
Can. Link-Belt Co., Toronto, Ont.
Canadian SKF Co., Toronto, Ont.
Chapman Double Ball Bearing Co., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Terry & Co., John C., Birmingham, Eng
Williams Machinery & Supply Co., A. R., Montreal, Que.

Hardening, Case-Hardening and Tempering
Hamilton Gear & Machine Co, Toronto, Ont.

Hardness Testing Apparatus
Shore Instrument Co., Jamaica, N.Y.

Heating
Skinner Bros Mfg Co., Inc., St Louis, Mo

Hobbing Machines
Herbert Ltd., Alfred, Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Hobs
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Brown & Sharpe Mfg. Co., Providence, R.I.
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Hoists, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Hoists, Hand
Lyman Tube & Supply Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Wright Mfg. Co., Lisbon, Ohio.

Hoists, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Curtis Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.

Holders-On, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Hose, Industrial
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Hose, Rubber
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Can. Foamite Firefoam Co., Hamilton, Ont.

Hydraulic Leather
Graton & Knight Mfg. Co., Worcester, Mass.

Hydraulic Machinery
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.

Hydrogen
National Electro Products, Ltd., Toronto, Ont.

Index Centers
Dickow, Fred. C., Machinery Co., Chicago, Ill.

Igniters, Gas Engine
Canada Foundries & Forgings Co., Welland, Ont.

Indicators, Speed and Test
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg. Co., Providence, R.I.

Insulation
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Jacks, Hydraulic
Norton, A. O., Boston, Mass.

Jacks, Planer
Armstrong Bros. Tool Co., Chicago, Ill.
Starrett Co., L. S., Athol, Mass.

Jigs
Bilton Machine Co., Bridgeport, Conn.
Burgess & Marchand, Montreal, Que.
Crescent Machine Co., Ltd., Montreal, Q.

BUYERS' DIRECTORY

Jigs and Fixtures (See Tool Work)
Fisher Motor Co., Ltd., Orillia, Ont
Ford-Smith Machine Co., Hamilton, Ont
Gisholt Machine Co., Madison, Wis.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Rapid Tool & Machine Co., Lachine, Que.

Keyseating Machines
Bilton Machine Co., Bridgeport, Conn.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Keys, Machine
Can. Drawn Steel Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.

Knives, Machine
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich.
Simonds Canada Saw Co., Montreal, Que.

Knurl Holders
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lacing Leather
Clipper Belt Lacer Co., Grand Rapids, Mich.
Main Belting Co. of Can., Montreal, Que.

Lamps, Electric
Federal Eng'r'ng Co., Ltd., Toronto, Ont.
Northern Electric Co., Montreal, Que.

Lathe Attachments
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.
Petrie, Ltd., H. W., Toronto, Ont.

Lathe Pans, Portable
Canada Machinery Corp., Galt, Ont.

Lathe Tools
Armstrong Bros. Tool Co., Chicago, Ill.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.

Lathes, Automatic and Semi-Automatic
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Gisholt Machine Co., Madison, Wis.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Bench
Archibald & Co., Chas. P., Montreal, Q.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Lathes, Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.

Lathes, Chucking (See Lathes, Horizontal Turret, and Lathes, Vertical Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
McDougall Co., Ltd., R., Galt, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Engine
Archibald & Co., Chas. P., Montreal, Q.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
Herbert Ltd., Alfred, Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Lehmann Machine Co., St. Louis, Mo.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill
Roelefson Machine & Tool Co., Toronto, Ont.
Sidney Machine Tool Co., Sidney, Ohio.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Walcott Lathe Co., Jackson, Mich.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Extension and Gap
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Gisholt Machine Co., Madison, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Lathes, Heavy Duty Projectile Boring
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Blashill Wire Machy. Co., Ltd., Montreal.
Sidney Machine Tool Co., Sidney, Ohio
Steinle Turret Machine Co., Madison, Wis.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Lathes, Horizontal Turret
Acme Machine Tool Co., Cincinnati, Ohio
Blount Co., J. G., Everett, Mass.
Gisholt Machine Co., Madison, Wis
Herbert Ltd., Alfred, Toronto, Ont
Jones & Lamson Machine Co., Springfield, Vt.
McDougall Co., Ltd., R., Galt, Ont.
National Acme Co., Cleveland, Ohio.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Lathe & Drill Co., Rockford, Ill.
Steinle Turret Machine Co., Madison, Wis
Warner & Swasey Co., Cleveland, Ohio.

Lathes, Polishing (See Polishing and Buffing Machines)
Ford-Smith Machine Co., Hamilton, Ont.

Lathes, Relieving
Canada Machinery Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
McDougall Co., Ltd., R., Galt, Ont.

Lathe, Universal Hand
Brown & Sharpe Mfg. Co., Providence, R.I.

Lathes, Screw-Cutting
Jones & Lamson Machine Co., Springfield, Vt.

Lathe, Speed and Hand
Blount Co., J. G., Everett, Mass.
Garlock-Walker Mchy. Co., Toronto, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Oliver Machy Co., Grand Rapids, Mich

Lathes, Spinning
Terry & Co., John C., Birmingham, Eng.

Lathes, Threading
Canada Machinery Corp., Galt, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
Hendey Machine Co., Torrington, Conn.
Lehmann Machine Co., St. Louis, Mo.

Lathes, Vertical Turret
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
Roelefson Machine & Tool Co., Toronto, Ont.

Lathes, Wood Turning
Blount Co., J. G., Everett, Mass.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Lead Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Lighting Fixtures
Northern Electric Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Linoleum Mill Machinery
Bertrams Ltd., Edinburgh, Scotland.

Liquid Air Plants
L'Air Liquide Society, Toronto, Ont.

Lockers, Clothes
Can. Foamite Firefoam Co., Hamilton, Ont.
Dennis Wire & Iron Works, London, Ont.

Lubricants
Cateract Refining Co., Toronto, Ont.
Oakley Chemical Co., New York, N.Y.

Lubricating Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Machinists' Small Tools
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Bertrams Ltd., Edinburgh, Scotland.
Brown & Sharpe Mfg. Co., Providence, R.I.
Canada Foundries & Forgings Co., Welland, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Dodge Mfg. Co. of Can., Toronto, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Ker & Goodwin Machine Co., Brantford, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Starrett Co., L. S., Athol, Mass.
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Manganese Steel
Can. Steel Foundries, Montreal, Que.

Mandrels, Expanding
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Mandrels, Solid
Atkins & Co., Inc., E. C., Indianapolis, I.
Cleveland Taps, Dies & Tools Co., Cleveland, O.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Measuring Machines
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Metals, Alloy
British Smelting & Refining Co., Ltd., Montreal, Que.
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.
Canada Metal Co., Ltd., Toronto, Ont.
Can. Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Can. Steel Foundries, Montreal, Que.
Deloro Smelting & Refining Co., Ltd., Toronto, Ont.
Fisher Motor Co., Ltd., Orillia, Ont.
Hoyt Metal Co., Toronto, Ont.
International Nickel Co. of Can., Ltd., Toronto, Ont.
Magnolia Metal Co., Montreal, Que.
Moore & Son, Thos., Montreal, Que.
Pilot Steel & Tool Co., Montreal, Que.
Tallman Brass & Metal, Ltd., Hamilton, Ontario
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Metalite Cloth
Ritchey Supply Co., Toronto, Ont.

Micrometer Calipers
Aikenhead Hardware Ltd., Toronto, Ont.
Brown & Sharpe Mfg. Co., Providence, R.I.
Rice Lewis & Son, Ltd., Toronto, Ont.

Milling Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.

Milling Machines
Brown & Sharpe Mfg. Co., Providence, R.I.

Milling Machines, Automatic
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Terry & Co., John C., Birmingham, Eng

Milling Machines, Bench
Burke Machine Tool Co., Conneaut, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.

Milling Machines, Hand
Burke Machine Tool Co., Conneaut, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Terry & Co., John C., Birmingham, Eng.
United States Machine Tool Co., Cincinnati, Ohio.

Milling Machines, Horizontal and Planer Type
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Milling Machine Co., Cleveland
Ford-Smith Machine Co., Hamilton, Ont
Gooley Edlund Inc., Cortland, N.Y.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont.
Williams Machinery Co., A. R., Toronto, Ont.

Milling Machines, Plain
Bilton Machine Co., Bridgeport, Conn.
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Cleveland Milling Machine Co., Cleveland.
Ford-Smith Machine Co., Hamilton, Ont
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gooley Edlund Inc., Cortland, N.Y.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Terry & Co., John C., Birmingham, Eng

Milling Machines, Thread
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Milling Machines, Universal
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada
Cincinnati Milling Machine Co., Cincinnati, Ohio.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hendey Machine Co., Torrington, Conn.
Holly, R. S., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Petrie, Ltd., H. W., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill.
Roelefson Machine & Tool Co., Toronto, Ont
Williams Machinery & Supply Co., A. R., Montreal, Que.

Milling Machines, Vertical
Cincinnati Milling Machine Co., Cincinnati, Ohio
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Kearney & Trecker Co., Milwaukee, Wis
Kempsmith Mfg. Co., Milwaukee, Wis
Rockford Milling Machine Co., Rockford, Ill
Williams Machinery Co., A. R., Toronto, Ont.

Monel Metal
International Nickel Co. of Can., Ltd., Toronto, Ont.

Motors, Electric
Atkins & Co., Inc., E. C., Indianapolis, I.
Garlock-Walker Mchy. Co., Toronto, Ont.
MacGovern & Co., Montreal, Que
Northern Electric Co., Montreal, Que.
Petrie, Ltd., H. W., Toronto, Ont.
Sturtevant Co., B. F., Boston, Mass
Williams Machinery Co., A. R., Toronto, Ont.
Wisconsin Electric Co., Racine, Wis

Moulded Rubber Goods
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Nail Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Nails and Staples
Steel Co. of Canada, Ltd., Hamilton, Ont.

Nickel, Bars, Sheets, Wire, Etc.
International Nickel Co. of Can., Ltd., Toronto, Ont.

Nickel Plating Outfits
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Nickel Silver
Brown's Copper & Brass Rolling Mills, Ltd., Toronto, Ont.

Nitrogen
L'Air Liquide Society, Toronto, Ont.

Nut Tappers (See Bolt and Nut Machinery)
Acme Machinery Co., Cleveland, Ohio
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Greenfield Tap & Die Corp., Galt, Ont.
National Acme Co., Cleveland, Ohio.

Nuts, Finished and Semi-finished
Galt Machine Screw Co., Galt, Ont.

Nuts, S.A.E., Plain and Castellated
Galt Machine Screw Co., Galt, Ont.

Oil Filtering and Storage Systems
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oil Storage Engineers
Bowser, S. F., & Co., Ltd., Toronto, Can.

Oils
Canadian Oil Companies, Ltd., Toronto, Ont
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oil Hole Covers
Can. Winkley Co., Ltd., Windsor, Ont.

Oils, Soluble
Cateract Refining Co., Toronto, Ont.
Imperial Oil Ltd., Toronto, Ont.

Oxygen
Carter Welding Co., Toronto, Ont.
Dominion Oxygen Co., Toronto, Ont.
L'Air Liquide Society, Toronto, Ont.

Oxy-Acetylene Apparatus
L'Air Liquide Society, Toronto, Ont.

Packing, Hydraulic
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Packing, Steam
Can. Consolidated Rubber Co., Ltd., Montreal, Que.
Graton & Knight Mfg. Co., Worcester, Mass.
Guildford & Sons, Ltd., Halifax, N.S.

Paper Mill Conveyors
Bertrams Ltd., Edinburgh, Scotland.

Patents
Fetherstonhaugh & Co., Ottawa, Ont.
Marion & Marion, Montreal, Que.

Pans, Wet and Dry
Frost Mfg. Co., Chicago, Ill.

Pattern-Shop Machinery (See Woodworking Machinery)
Canada Machinery Corp., Galt, Ont.
Oliver Machinery Co., Grand Rapids, Mich.

Patterns, Wood and Metal
Crescent Machine Co., Ltd., Montreal, Q.
Victoria Foundry Co., Ltd., Ottawa, Ont.
Wraggis Pattern Works, Galt, Ont.

Penstocks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

BUYERS' DIRECTORY

Phosphor Tin
British Smelting & Refining Co., Ltd., Montreal, Que.

Photographic Duplicating Machines
Commercial Camera Co., Providence, R.I.

Pig Iron
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Bending Machines
American Pipe Bending Machine Co., Boston, Mass.
Underwood Corp., H. B., Philadelphia, Pa.
Williams Machinery Co., A. R., Toronto, Ont.

Pipe Couplings
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pipe Cutting and Threading Machines
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
Landis Machine Co., Inc., Waynesboro, Pa.
Murchey Machine & Tool Co., Detroit, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Pipe and Nipple Threading Machines
Landis Machine Co., Inc., Waynesboro, Pa.

Pipe Fitters' Tools
Aikenhead Hardware Ltd., Toronto, Ont.
Crane Ltd., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.

Pipe Threading Die Heads
Landis Machine Co., Inc., Waynesboro, Pa.

Piston-Ring Machines
National Acme Co., Cleveland, Ohio.
Steinle Turret Machine Co., Madison, Wis.

Planers, Parallels
L. & P. Mfg Co., Niagara Falls, Ont.

Planing Machines
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
L. & P. Mfg Co., Niagara Falls, Ont.
Morton Mfg. Co., Muskegon, Mich.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Planing Machines, Rotary
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.

Plate Rolls
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Pneumatic Tools
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Polishing and Buffing Machines
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Blount Co., J. G., Everett, Mass.
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Hanson & Van Winkle Co., Ltd., Toronto, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Terry & Co., John C., Birmingham, Eng.

Pots, Steel
Swedish Crucible Steel Co. of Canada, Ltd., Windsor, Ont.

Pressed Steel Parts
Ackworthie, Ltd., John, Birmingham, Eng.
American Pulley Co., Philadelphia, Pa.
Fisher Motor Co., Ltd., Orillia, Ont.

Presses, Arbor
Atlas Press Co., Kalamazoo, Mich.
National Engineering Co., Sarnia, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Strelinger Co of Can., Ltd., Chas. A., Windsor, Ont.

Presses, Drop and Forging
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Foundries & Forgings Co., Welland, Ont.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Foot and Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Terry & Co., John C., Birmingham, Eng.

Presses, Forcing
Atlas Press Co., Kalamazoo, Mich.
Stewart & Co., Duncan, Glasgow, Scot.

Presses, Hydraulic
Baird Machine Co., Bridgeport, Conn.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Laurie Mfg Co., Springfield, Ill.
Perrin Ltd., W. R., Toronto, Ont.
Stewart & Co., Duncan, Glasgow, Scot.
Williams Machinery Co., A. R., Toronto, Ont.

Presses, Power
[illegible] Co., F. W., Brockton, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Henry & Wright Mfg. Co., Hartford, Conn.
Petrie, Ltd., H. W., Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Toledo Machine & Tool Co., Toledo, Ohio.

Presses, Screw
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Petrie, Ltd., H. W., Toronto, Ont.

Profiling Machines
Aikenhead Hardware Ltd., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Protractors
Brown & Sharpe Mfg. Co., Providence, R.I.

Propellers
Kennedy & Sons, Wm., Owen Sound, Ont.

Pulleys, Cork Insert
American Pulley Co., Philadelphia, Pa.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Positive Clutch & Pulley Works, Toronto, Ont.

Pulleys, Metal and Fibre
American Pulley Co., Philadelphia, Pa.
Bernard Industrial Co., A., Fortierville, Que.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Canadian SKF Co., Toronto, Ont.
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Johnson Machine Co., Carlyle, Manchester, Conn.
Kennedy & Sons, Wm., Owen Sound, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Pulp and Paper Mill Equipment
MacKinnon Steel Co., Sherbrooke, Que.

Pumps, Automobile Tire
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Pumps, Barrel and Boiler-feed
Trahern Pump Co., Rockford, Ill.

Pumps, Circulating and Coalant
Trahern Pump Co., Rockford, Ill.

Pumps, Geared and Hand
Trahern Pump Co., Rockford, Ill.

Pumps, Industrial
Trahern Pump Co., Rockford, Ill.

Pumps, Hydraulic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Electric Steel & Engineering Co., Welland, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.
Trahern Pump Co., Rockford, Ill.

Pumps, Lubricant and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Hepburn Ltd., John T., Toronto, Ont.
McDougall Co., Ltd., R., Galt, Ont.
Trahern Pump Co., Rockford, Ill.

Pumps, Power
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Blower & Forge Co., Ltd., Kitchener.
Can. Fairbanks-Morse Ltd., Montreal, Q.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Hepburn Ltd., John T., Toronto, Ont.
Trahern Pump Co., Rockford, Ill.

Punches, Center
Brown & Sharpe Mfg. Co., Providence, R.I.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Starrett Co., L. S., Athol, Mass.

Punches, Hand
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Can. Blower & Forge Co., Ltd., Kitchener
Jardine & Co., A. B., Hespeler, Ont.

Punches, Power
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Garlock-Walker Mchy. Co., Toronto, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Toledo Machine & Tool Co., Toledo, Ohio

Punching Machines, Horizontal
Bertrams Ltd., Edinburgh, Scotland.

Pyrometers, Electric
Bristol Co., Waterbury, Conn.
General Combustion Co. of Can., Ltd., Montreal, Que.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Racks, Cut
Ford-Smith Machine Co., Hamilton, Ont.
Hamilton Gear & Machine Co., Toronto, Ont.

Racks, Storage (See Furniture, Machine Shop)
Brantford Oven & Rack Co., Brantford, Ont.

Rammers, Foundry
Holden Co., Ltd., Montreal, Que.

Reamer Holders
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Victor Tool Co., Waynesboro, Pa.

Reamers, Expanding
Aikenhead Hardware Ltd., Toronto, Ont.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
McCroskey Tool Corp., Meadville, Pa.
Pratt & Whitney Co. of Canada, Ltd., Dundas, Ont.

Reamers, Solid
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.

Reamers, Taper
Butterfield & Co., Inc., Rock Island, Que.
Can. Detroit Twist Drill Co., Walkerville, Ont.
Cleveland Twist Drill Co., Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Garlock-Walker Mchy. Co., Toronto, Ont.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Galt, Ont.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Recorders, Temperature
Taylor Instrument Co., Rochester, N.Y.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Recorders, Time
Gisholt Machine Co., Madison, Wis.
International Business Machines Co., Toronto, Ont.

Regulators, Automatic (for electric furnaces)
Volta Mfg Co., Welland, Ont

Rheostats
Northern Electric Co., Montreal, Que.

Resistance Materials
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Respirators
Willson Goggles, Inc., Reading, Pa.

Rivets
Parmenter & Bulloch Co., Gananoque, Ont.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Rivet Heaters
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
General Combustion Co. of Can., Ltd., Montreal, Que.
Volta Mfg. Co., Welland, Ont.

Rivet-Making Machinery
Acme Machinery Co., Cleveland, Ohio.
Bertram & Son Co., Ltd., The John, Dundas, Ont.
National Machinery Co., Tiffin, Ohio.

Riveting Machines
Bilton Machine Co., Bridgeport, Conn.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
High Speed Hammer Co., Rochester, N.Y.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Petrie, Ltd., H. W., Toronto, Ont.
Schuster Co., F. B., New Haven, Conn.

Rolling Mill Equipment
Stewart & Co., Duncan, Glasgow, Scot.

Rolls (Rubber Covered)
Can. Consolidated Rubber Co., Ltd., Montreal, Que.

Rudder Frames, Steel
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Rubber Goods, Mechanical
Quaker City Rubber Co., Philadelphia, Pa.

Rules, Steel
Chesterman & Co., Ltd., J., Sheffield, Eng.

Rules, Steel and Wood
Brown & Sharpe Mfg. Co., Providence, R.I.

Rust Preventatives
Oakley Chemical Co., New York, N.Y.

Sand Equipment
Can. Link-Belt Co., Toronto, Ont.

Sand Mills
Frost Mfg Co., Chicago, Ill.

Sanding Machinery
Oliver Machy Co., Grand Rapids, Mich.

Sand Rammers, Pneumatic
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.
Keller Pneumatic Tool Co., Grand Haven, Mich.

Saw Frames and Blades, Hack
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Clemson Bros., Inc., Hamilton, Ont.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Simonds Canada Saw Co., Montreal, Que.

Sawing Machines, Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Herbert Ltd., Alfred, Toronto, Ont.
Lyman Tube & Supply Co., Montreal, Que.

Sawing Machines, Power Hack
Ackworthie, Ltd., John, Birmingham, Eng.
Atkins & Co., Inc., E. C., Indianapolis, I.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Saw Sharpening Machines
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saw Tables, Universal
Atkins & Co., Inc., E. C., Indianapolis, I.
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Petrie, Ltd., H. W., Toronto, Ont.

Saws, Circular Metal
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Tabor Mfg. Co., Philadelphia, Pa.

Saws, Hand
Aikenhead Hardware Ltd., Toronto, Ont.
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.

Saws, Hot and Cold
Atkins & Co., Inc., E. C., Indianapolis, I.
Simonds Canada Saw Co., Montreal, Que.
Stewart & Co., Duncan, Glasgow, Scot.

Saws, High Speed Steel
Armstrong-Whitworth of Canada, Ltd., Montreal, Canada.
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Hamilton, Canada
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Metal Band
Atkins & Co., Inc., E. C., Indianapolis, I.
Oliver Machinery Co., Grand Rapids, Mich.

Saws, Metal, Power
Clemson Bros., Inc., Hamilton, Ont.

Saws, Metal Cutting
Atkins & Co., Inc., E. C., Indianapolis, I.
Brown & Sharpe Mfg Co., Providence, R.I.
Butterfield & Co., Inc., Rock Island, Que.
Clemson Bros., Inc., Hamilton, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.
Starrett Co., L. S., Athol, Mass.

Saws, Milling
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Saws, Screw Slotting
Atkins & Co., Inc., E. C., Indianapolis, I.
Butterfield & Co., Inc., Rock Island, Que.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Simonds Canada Saw Co., Montreal, Que.

Saws, Swing Cut-off
Oliver Machinery Co., Grand Rapids, Mich.

Scales
Brown & Sharpe Mfg. Co., Providence, R.I.
Can. Fairbanks-Morse Ltd., Montreal, Q.

Screens
Can. Wire & Iron Goods Co., Hamilton, Ont.

Screw Driving Machine
Canada Machinery Corp., Galt, Ont.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Holden Co., Ltd., Montreal, Que.
Independent Pneumatic Tool, Chicago, Ill.

Screw Extractors
Cleveland Twist Drill Co., Cleveland, O.

Screw Machine Work
Barnes Co., Wallace, Bristol, Conn.
Cook Co., Asa S., Hartford, Conn.
National Acme Co., Cleveland, Ohio.
Tallman Brass & Metal Co., Hamilton, Ont.

BUYERS' DIRECTORY

Screw Machinery, Wood and Lag
Cook Co., Asa S., Hartford, Conn.

Screw Machines
Brown & Sharpe Mfg Co., Providence, R I

Screw Machines, Automatic
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
National Acme Co., Cleveland, Ohio.

Screw Machines, Plain or Hand
Acme Machine Tool Co., Cincinnati, Ohio.
Greenfield Tap & Die Corp., Galt, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Jones & Lamson Machine Co., Springfield, Vermont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Warner & Swasey Co., Cleveland, Ohio.

Screw Plates
Aikenhead Hardware Ltd., Toronto, Ont.
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.

Screws, Cap and Set
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Screws, Machine
Barnes Co., Wallace, Bristol, Conn.
Steel Co. of Canada, Ltd., Hamilton, Ont.

Screws, Safety Set
Barnes Co., Wallace, Bristol, Conn.
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.

Second-Hand Machinery
(See Searchlight Section)
Petrie, Ltd., H. W., Toronto, Ont.

Separators, Moisture and Oil
Bowser, S. F., & Co., Ltd., Toronto, Can
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Separators, Oil and Waste
Bowser, S. F., & Co., Ltd., Toronto, Can.

Shafting
Canada Foundries & Forgings Co., Welland, Ont.
Can. Drawn Steel Co., Hamilton, Ont.
N.S. Steel Co., Ltd., New Glasgow, N.S.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Shapes, Cold-Drawn Special Steel
Union Drawn Steel Co., Hamilton, Ont.

Shaping Machines
Canada Machinery Corp., Galt, Ont.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Hendey Machine Co., Torrington, Conn.
Herbert Ltd., Alfred, Toronto, Ont.
Holly, R. S., Toronto, Ont.
Morton Mfg. Co., Muskegon, Mich.
McDougall Co., Ltd., R., Galt, Ont.
Roelefson Machine & Tool Co., Toronto, Ont.
Smith & Mills Co., Cincinnati, Ohio
Walcott Lathe Co., Jackson, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Shapers, Wood
Oliver Machinery Co., Grand Rapids, Mich.

Shears, Hand
Can. Blower & Forge Co., Ltd., Kitchener.

Shears, Power
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Canada Machinery Corp., Galt, Ont.
Can. Blower & Forge Co., Ltd., Kitchener.
Stall Co., Inc., D. H., Buffalo, N.Y.
Stewart & Co., Duncan, Glasgow, Scot.
Toledo Machine & Tool Co., Toledo, Ohio.
Williams Machinery Co., A. R., Toronto, Ont.

Shearing Machines, Angle, Iron Bar and Gate
Bertrams Ltd., Edinburgh, Scotland.

Sheet Metal Working Machinery
Bliss Co., E. W., Brooklyn, N.Y.
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Herbert Ltd., Alfred, Toronto, Ont.
Stall Co., Inc., D. H., Buffalo, N.Y.
Terry & Co., John C., Birmingham, Eng.
Toledo Machine & Tool Co., Toledo, Ohio.

Sheets, Nickel, Resist, Alloy
International Nickel Co. of Can., Ltd., Toronto, Ont.

Sheets, Nickel, Monel and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.

Side Frames, Locomotive
Can. Steel Foundries, Montreal, Que.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Slotting Attachments
Ford-Smith Machine Co., Ltd., Hamilton, Ont.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg Co, Milwaukee, Wis.
National Acme Co., Cleveland, Ohio.

Slotting Machines
Bertram & Son Co., Ltd., The John Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Ford-Smith Machine Co., Hamilton, Ont.
Herbert Ltd., Alfred, Toronto, Ont.

Solders
British Smelting & Refining Co., Ltd. Montreal, Que
Hoyt Metal Co., Toronto, Canada.

Snap Flasks
Oliver Machy. Co., Grand Rapids, Mich.

Special Machinery and Tools
Brown Engineering Corp., Ltd., Toronto.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Gisholt Machine Co., Madison, Wis.
Ingersoll Machine & Tool Co., Ltd., Ingersoll, Ont.
National Acme Co., Cleveland, Ohio.

Spectacles, Industrial
Willson Goggles, Inc., Reading, Pa.

Springs
Barnes Co., Wallace, Bristol, Conn.
Cleveland Wire Spring Co., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Steele Ltd., James, Guelph, Ont.

Spring-making Machinery
Sleeper & Hartley, Inc., Worcester, Mass

Sprockets and Chains
Can. Link-Belt Co., Toronto, Ont.
Jones & Glassco, Montreal, Que.
Lyman Tube & Supply Co., Montreal, Que.
Morse Chain Co., Ithaca, N.Y.
Renold (Hans) of Canada, Ltd., Montreal, Que.

Squares
Brown & Sharpe Mfg Co., Providence, R.I.

Stamping, Metal
American Pulley Co., Philadelphia, Pa.
Barnes Co., Wallace, Bristol, Conn.
Diamond Saw & Stamping Works, Buffalo, N.Y.
Fisher Motor Co., Ltd., Orillia, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich.
Parmenter & Bulloch Co., Gananoque, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Stamps, Steel
Diamond Saw & Stamping Works, Buffalo, N.Y.

Stairways, Wrought Iron
Can. Wire & Iron Goods Co., Hamilton, Ont

Steam Specialties
Crane Ltd., Montreal, Que.

Steel Plate
Dom. Foundries & Steel, Hamilton, Ont.

Steels, Tool
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel Blooms and Billets
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steel, Cold-Rolled Strip
Andrews Steel Co., Newport, Ky
Barnes Co., Wallace, Bristol, Conn.
Can. Driver-Harris Co., Walkerville, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.

Steel Castings
Dom. Foundries & Steel, Hamilton, Ont.

Steel Forgings
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Steel, Shafting and Free Cutting Screw
Barnes Co., Wallace, Bristol, Conn.
Can. Drawn Steel Co., Hamilton, Ont
Union Drawn Steel Co., Hamilton, Ont.

Steel, Sheet
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Rice Lewis & Son, Ltd., Toronto, Ont
Steel Co. of Can., Ltd., Hamilton, Ont.
Toronto Iron Works, Toronto, Ont.

Steel, Tanks
Can. John Wood Mfg Co., Toronto, Ont

Steel, Stainless
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel Wire Rods
Steel Co. of Canada, Ltd., Hamilton, Ont.

Steels, Alloy, Open Hearth and Electric
United Alloy Steel Corp., Canton, Ohio.

Steels, Alloy and Carbon
Algoma Steel Corp., Ltd., Sault Ste. Marie, Ont.
Andrews Steel Co., Newport, Ky
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Barnes Co., Wallace, Bristol, Conn.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Driver-Harris Co., Walkerville, Ont.
Can. Steel Foundries, Montreal, Que.
Dom. Foundries & Steel, Hamilton, Ont.
Firth & Sons, Ltd., Thos., Montreal, Q.
Dominion Foundries & Steel, Ltd., Hamilton, Ont.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steels, High-Speed
Armstrong Bros. Tool Co., Chicago, Ill.
Armstrong Whitworth Co. of Can., Ltd., Montreal, Que.
Atkins & Co., Ltd., Wm., Sheffield, Eng.
Baines & David, Ltd., Toronto, Ont.
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.
Drury Ltd., H. A., Montreal, Que.
Firth & Sons, Ltd., Thos., Montreal, Q.
Pilot Steel & Tool Co., Montreal, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Steel Co. of Can., Ltd., Hamilton, Ont.
Vanadium Alloys Steel, Latrobe, Pa.
Vulcan Crucible Steel Co., Aliquippa, Pa.

Steel, Magnet
Can. Atlas Crucible Steel Co., Toronto, Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Steel, Structural
MacKinnon Steel Co., Sherbrooke, Que.

Steel Tubing, Close Joint and Welded
Standard Tube & Fence Co., Ltd., Woodstock, Ont.

Stern Frames, Cast Steel
Can. Steel Foundries, Montreal, Que
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Straightening Machinery
Bertrams Ltd., Edinburgh, Scotland.

Studs
Galt Machine Screw Co., Galt, Ont.

Surface Plates
Bilton Machine Co., Bridgeport, Conn.

Swaging Machines
Atkins & Co., Inc., E. C., Indianapolis, I

Switches, Railway
Can. Steel Foundries, Montreal, Que

Switches and Switchboards
Northern Electric Co., Montreal, Que.

Tablets, Bronze, Memorial
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Tachometers
Aikenhead Hardware Ltd., Toronto, Ont.
Bristol Co., Waterbury, Conn.

Tanks, Steel
MacKinnon Steel Co., Sherbrooke, Que.

Tanks and Pumps, Oil
Bowser, S. F., & Co., Ltd., Toronto, Can.
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.
Toronto Iron Works, Toronto, Ont.

Taper Cutting Dies
Jones & Lamson Machine Co., Springfield, Vt.

Tap Holders
Greenfield Tap & Die Corp., Galt, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taper Pins
Galt Machine Screw Co., Galt, Ont.
Morrow Screw & Nut Co., Ltd., John, Ingersoll, Ont.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Tapes, Measuring
Chesterman & Co., Ltd., J., Sheffield, Eng.
Starrett Co., L. S., Athol, Mass.

Tapping Machines and Attachments
Ackworthie, Ltd., John, Birmingham, Eng.
Archibald & Co., Chas. P., Montreal, Q.
Burke Machine Tool Co., Conneaut, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Jardine & Co., A. B., Hespeler, Ont.
National Acme Co., Cleveland, Ohio.
Pratt, Ltd., H. W., Toronto, Ont.
Starrett Co., L. S., Athol, Mass

Taps and Dies
Ackworthie, Ltd., John, Birmingham, Eng.
Butterfield & Co., Inc., Rock Island, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
International Machinery & Supply Co., Montreal, Que.
Jardine & Co., A. B., Hespeler, Ont.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.

Taps, Collapsing
Geometric Tool Co., New Haven, Conn.
Jardine & Co., A. B., Hespeler, Ont.
Morrow Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio.
Victor Tool Co., Waynesboro, Pa.

Teeth, Dredge Bucket
Kennedy & Sons, Wm., Owen Sound, Ont

Testing Metals and Materials
Toronto Testing Laboratory, Toronto, Ont.

Thermometers
Bristol Co., Waterbury, Conn.

Thread-Cutting Tools
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.
Jones & Lamson Machine Co., Springfield, Vt.
Morse Machine & Tool Co., Detroit, Mich.
National Acme Co., Cleveland, Ohio
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Victor Tool Co., Waynesboro, Pa.

Thread Cutting Machines
Jones & Lamson Machine Co., Springfield, Vermont.
Landis Machine Co., Inc., Waynesboro, Pa.

Threading Machines
Acme Machinery Co., Cleveland, Ohio
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont
Jones & Lamson Machine Co., Springfield, Vt.
Murchey Machine & Tool Co., Detroit, Mich
National Acme Co., Cleveland, Ohio.
National Machinery Co., Tiffin, Ohio.
Williams Tool Corp. of Can., Ltd., Brantford, Ont.

Thread Lead Testing Machines
Jones & Lamson Machine Co., Springfield, Vt
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont

Thread-Rolling Machines
Bliss Co., E. W., Brooklyn, N.Y.

Tongs
Hepburn Ltd., John T., Toronto, Ont.

Tool Cases
Rice Lewis & Son, Ltd., Toronto, On.

Tool Holders
Armstrong Bros. Tool Co., Chicago, Ill.
Bilton Machine Co., Bridgeport, Conn.
Gisholt Machine Co., Madison, Wis.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Markers, Electric
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Tool Posts, Lathe
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Canada Machinery Corp., Galt, Ont.
Williams & Co., J. H., Brooklyn, N.Y.

Tool Steels for all Purposes
Canadian Atlas Crucible Steel Co., Ltd., Toronto, Ont.

Tools, Small (See Machinists' Small Tools)
Armstrong Whitworth of Canada, Ltd., Montreal, Canada
Armstrong Bros. Tool Co., Chicago, Ill.
Bertrams Ltd., Edinburgh, Scotland.
Burgess & Marchand, Montreal, Que
Chesterman & Co., Ltd., J., Sheffield, Eng.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Galt, Ont.
Hamilton Engineering Service, Ltd., Hamilton, Ont.
Keller Pneumatic Tool Co., Grand Haven, Mich
Kimber & Hillier Mfg. Co., St. Catharines, Ont.
National Machine Tool Co., Racine, Wis.
Rapid Tool & Machine Co., Lachine, Que.
Rice Lewis & Son, Ltd., Toronto, Ont.
Rockford Milling Machine Co., Rockford, Ill
Starrett Co., L. S., Athol, Mass
Strelinger Co. of Can., Ltd., Chas. A., Windsor, Ont.
Wheel Trueing Tool Co., Detroit, Mich.
Williams Machinery Co., A. R., Toronto, Ont.
Williams Machinery & Supply Co., A. R., Montreal, Que.

Tool Work
Brown Engineering Corp., Ltd., Toronto.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.

Torches, Blow
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Rice Lewis & Son, Ltd., Toronto, Ont.

Trackwork, Railway
Can. Steel Foundries, Montreal, Que.

Trackwork, Manganese Steel
Can. Steel Foundries, Montreal, Que.

Transformers
Northern Electric Co., Montreal, Que.

Transmission Machinery
Bernard Industrial Co., A., Fortierville Que.
Can. Link-Belt Co., Toronto, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont
Jones & Glassco, Montreal, Que.
Kennedy & Sons, Wm., Owen Sound, Ont
Petrie, Ltd., H. W., Toronto, Ont.
Positive Clutch & Pulley Works, Toronto, Ont
Renold (Hans) of Canada, Ltd., Montreal, Que.

Transportation Systems (See Trucks)
Mathews Gravity Carrier Co., Port Hope, Ont.

Treated Bits
Can. Atlas Crucible Steel Co., Toronto Ont.
Vanadium Alloys Steel, Latrobe, Pa.

Trolleys and Tramways
Can. Link-Belt Co., Toronto, Ont.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
Northern Crane Works, Walkerville, Ont.
Wright Mfg. Co., Lisbon, Ohio.

BUYERS' DIRECTORY

Trucks
Can. Fairbanks Morse Ltd., Montreal, Q.
Diamond State Fibre Co., Toronto, Ont.
Hepburn Ltd., John T., Toronto, Ont.
Maple Leaf Mfg. Co., Montreal, Que.
Morris Crane & Hoist Co., Ltd., Niagara Falls, Ont.
National Steel Car Corp., Ltd., Hamilton, Ont.

Trucks, Industrial Motor
Maple Leaf Mfg. Co., Montreal, Que.
National Steel Car Corp., Ltd., Hamilton, Ont.

Tube, Products
Tube Co. of Canada, Toronto, Ont.

Tubing, Electric Welded or Oxy-Acetylene Welded
Tube Co. of Canada, Toronto, Ont.

Tubing, Flexible
Dunlop Tire & Rubber Goods Co., Ltd Toronto, Ont.
Goodyear Tire & Rubber Co of Can., Ltd., Toronto, Ont.

Tubing, Seamless Steel
Tube Co. of Canada, Toronto, Ont.

Tubing, Seamless Steel, Brass and Copper and Fibre
Diamond State Fibre Co. of Can., Ltd., Toronto, Ont.
Dom. Steel Products Co., Brantford, Ont.
Lyman Tube & Supply Co., Montreal, Que.
Tallman Brass & Metal Co., Hamilton, Ont.

Tubing, Welded
International Nickel Co. of Can., Ltd., Toronto, Ont.

Tubing, Welded Steel
Tube Co. of Canada, Toronto, Ont.

Turbines, Water
Kennedy & Sons, Wm., Owen Sound, Ont.

Turret Heads
Ackworthie, Ltd., John, Birmingham, Eng.
Bertram & Son Co., Ltd., The John, Dundas, Ont.

Turret Machines (See Lathes, Horizontal Turret)
Acme Machine Tool Co., Cincinnati, Ohio.
Cook Co., Asa S., Hartford, Conn.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vermont.
National Acme Co., Cleveland, Ohio.
Pratt & Whitney Co., of Canada, Ltd., Dundas, Ont.
Steinle Turret Machine Co., Madison, Wis.
Warner & Swasey Co., Cleveland, Ohio.

Turrets, Tool Post
Gisholt Machine Co., Madison, Wis.

Unions, Pipe
Crane Ltd., Montreal, Que.

Universal Joints
Ford-Smith Machine Co., Hamilton, Ont.
Holden Co., Ltd., Montreal, Que.

Valves
Can. Fairbanks-Morse Ltd., Montreal, Q.
Cleveland Pneumatic Tool Co., Toronto, Ont.
Crane Ltd., Montreal, Que.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.

Vises, Drilling Machine
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Metal Workers'
Aikenhead Hardware, Ltd., Toronto, Ont.
Columbia Hdwe. Division, Cleveland, O.

Vises, Milling Machine
Brown & Sharpe Mfg. Co., Providence, R.I.
Crescent Machine Co., Ltd., Montreal, Q.
Ford-Smith Machine Co., Hamilton, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.

Vises, Pipe
Columbia Hdwe. Division, Cleveland, O.
Greenfield Tap & Die Corp., Galt, Ont.

Vises, Planer and Shaper
Bertram & Son Co., Ltd., The John, Dundas, Ont.
Hendey Machine Co., Torrington, Conn.
Hoosier Drilling Mach. Co., Goshen, Ind.
Kempsmith Mfg. Co., Milwaukee, Wis.
McDougall Co., Ltd., R., Galt, Ont.
Superior Machine Co., London, Ont.

Vises, Wood Workers'
Columbia Hdwe. Division, Cleveland, O.
Foss Machinery & Supply Co., Geo. F., Montreal, Que.
Oliver Machy. Co., Grand Rapids, Mich
Victor Tool Co., Waynesboro, Pa.
Parmenter & Bulloch Co., Gananoque, Ont.

Voltmeters
Bristol Co., Waterbury, Conn.
Northern Electric Co., Montreal, Que.

Wagon Loaders
Can. Link-Belt Co., Toronto, Ont.

Washers
Barnes Co., Wallace, Bristol, Conn.
Diamond State Fibre Co., Toronto, Ont.
Dunlop Tire & Rubber Goods Co., Ltd., Toronto, Ont.
Goodyear Tire & Rubber Co. of Can., Ltd., Toronto, Ont.
Graton & Knight Mfg. Co., Worcester, Mass.
McLaren Belting Co., J. C., Montreal, Que.
Steel Co. of Canada, Ltd., Hamilton, Ont

Washers, Rubber
Can. Ingersoll-Rand Co., Ltd., Sherbrooke, Que.

Welding Apparatus, Oxy-Acetylene
L'Air Liquide Society, Toronto, Ont.

Welding, Electric
All-Weld Company, Toronto, Ont.
Carter Welding Co., Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.

Welding Filler Rods
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding Machines, Oxy-Acetylene
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
L'Air Liquide Society, Toronto, Ont.
Perdue, W. B., San Francisco, Calif
Prest-O-Lite Co. of Can., Toronto, Ont.

Welding, Oxy-Acetylene
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
Holden Co., Ltd., Montreal, Que.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Prest-O-Lite Co. of Can., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

Welding Rod, Tobin, Manganese Bronze and Aluminum
Tallman Brass & Metal, Ltd., Hamilton, Ont.

Welding Supplies
British Smelting & Refining Co., Ltd., Montreal, Que.
Carter Welding Co., Toronto, Ont.
Davis-Bournonville Co., Jersey City, N.J.
L'Air Liquide Society, Toronto, Ont.
Lincoln Electric Co., Toronto, Ont.
National Electro Products, Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Canada, Ltd., Toronto, Ont.
Union Carbide Co. of Can., Welland, Ont.

Wheels, Cast, Steel
Dominion Foundries & Steel, Ltd., Hamilton, Ont.

Wheels, Industrial
American Pulley Co., Philadelphia, Pa.
Hull Iron & Steel Foundries, Hull, Que.
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Electric
Shepard Electric Crane & Hoist Co., Montour Falls, N.Y.
Volta Mfg. Co., Welland, Ont.

Winches, Headgate
Kennedy & Sons, Wm., Owen Sound, Ont.

Winches, Stoplog
Kennedy & Sons, Wm., Owen Sound, Ont.

Wire
Barnes Co., Wallace, Bristol, Conn.
Canada Metal Co., Ltd., Toronto, Ont.
Dennis Wire & Iron Works, London, Ont
Greening Wire Co., B., Hamilton, Ont.
Northern Electric Co., Montreal, Que.

Wire Cloth
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Coiling Machinery
Sleeper & Hartley, Inc., Worcester, Mass.

Wire Rope
Can. Wire & Iron Goods Co., Hamilton, Ont.

Wire Straightening and Cutting Machinery
Baird Machine Co., Bridgeport, Conn
Brown, Boggs & Co., Ltd., Hamilton, Ont.
Schuster Co., F. B., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

Wire, Welding
L'Air Liquide Society, Toronto, Ont.
National Electro Products, Ltd., Toronto, Ont.
Perdue, W. B., San Francisco, Calif.
Prest-O-Lite Co. of Can., Toronto, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Wires, Special
Dennis Wire & Iron Works, London, Ont.
Greening Wire Co., B., Hamilton, Ont.
Walker & Sons Metal Products, Ltd., Hiram, Walkerville, Ont.

Woodworking Machinery
Canada Machinery Corp., Galt, Ont.
Garlock-Walker Mchy. Co., Toronto, Ont.
Oliver Machinery Co., Grand Rapids, Mich.
Williams Machinery Co., A. R., Toronto, Ont.

Wrenches, Drop Forged
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Machinists'
Armstrong Bros. Tool Co., Chicago, Ill.
Canada Foundries & Forgings Co., Welland, Ont.

Wrenches, Pipe
Canada Foundries & Forgings Co., Welland, Ont.
Crane Ltd., Montreal, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrenches, Tap
Butterfield & Co., Inc., Rock Island, Que.
Greenfield Tap & Die Corp., Galt, Ont.

Wrought Iron Pipe
Steel Co. of Canada, Ltd., Hamilton, Ont.

Pages
106-7-8-9-110
Are for You

Greaves-Etchells
Electric Furnace
FURNACES FOR EVERY PURPOSE
Electric Furnace Construction Co.
908 Chestnut Street Phila., Pa.

THE
TRADE K—T MARK
FOUNDRY
GALT, ONT.

Do Your Castings Cost Too Much?

A rearrangement of your patterns might cut their cost 25 per cent.; a different method of molding them might double your production at no increase in molding cost. We can advise you and we have expert metal and wood patternmakers who are able to make any changes that may commend themselves to you.

If you need some new Patterns

send us a sample, blueprint or sketch, and ask for our advice. It won't cost you anything. If our advice is good and commends itself to you, it is only fair to assume that our work will be equally satisfactory, and we need the work as badly as you need the patterns.

We are in a position to do turning, boring, drilling or other semi-finishing operations on castings supplied by us. Ask us.

We have for our and your requirements, a large stock of assorted White Iron Stars, suitable for light agricultural to medium weight machinery castings, while they last, at 8 cents per lb. F. O. B. Galt.

ALLOY STEELS

OPEN HEARTH AND ELECTRIC FURNACE

BARS
Hot Rolled and Cold Drawn

BILLETS
Slabs—Blooms

Chrome-Vanadium
Nickel (3½ and 5%)
Chrome-Molybdenum
Chrome-Nickel
Magnet Steel (Tungsten and Chrome)
Carbon-Chrome
Nickel-Chrome-Molybdenum
Nickel-Chrome-Vanadium
Chrome
Ball and Race Steel
Electric Furnace Hi-Carbon
Special Analyses

WHEN you purchase or specify our Alloy Steels for your product, you get with the steel the assurance that a competent metallurgist is at your service in the working and treatment of that steel.

Our standard analyses embrace all types of Commercial Alloy Steels—open hearth and electric furnace grades, and our specialization in the manufacture of Alloy Steels enables us to assist our customers in the selection of the correct steel for their requirements.

We melt—roll—cold draw—heat treat our steels in one large plant and under expert supervision.

Avail yourself of our consultatory service:

If you have any place in your manufacture where you think you could use an Alloy Steel to advantage, give our engineers the opportunity of assisting you in the selection of the proper grade and type.

UNITED ALLOY STEEL CORPORATION
CANTON, OHIO

DETROIT
SYRACUSE
CLEVELAND

PHILADELPHIA
NEW YORK
INDIANAPOLIS

CHICAGO
SAN FRANCISCO
PORTLAND

If interested tear out this page and place with letters to be answered.

HINTS TO BUYERS

STEEL CASTINGS

ELECTRIC Steel Castings of all kinds from 5 pounds to 5,000 pounds.

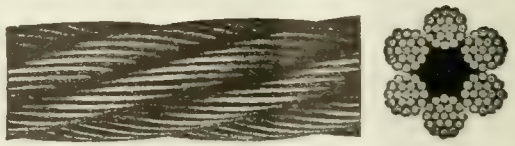
PROMPT DELIVERY

Manitoba Steel Foundries, Ltd.

1204 McArthur Building

Winnipeg - - - Manitoba

WIRE ROPE



"We have the Right Rope for every purpose"

We solicit your inquiries Write for our catalogue

We also manufacture

Wirecloth, Perforated Metal and Guards for Machinery and Windows

Canada Wire & Iron Goods Co., Hamilton

The Hughes Owens Co. Ltd.

MONTREAL TORONTO OTTAWA WINNIPEG

Manufacturers

Blue and Black Print Papers

Drawing Office Supplies for Students, Architects and Engineers.

Mechanical Engineering Company

Limited

PRACTICAL AND CONSULTING ENGINEERS

Builders of "MECOL" Industrial Furnaces for use with oil, gas or coal fuel

Executive Offices
Room 408, 3 St. Nicholas St.
Montreal

General Offices and Works
Three Rivers, Que.

FOR SERVICE ON

Jigs, Fixtures, Gauges

SPECIAL MACHINE TOOLS

SPECIAL MACHINERY

General Machine Work and Repairs

Write

The Crescent Machine Co.

LIMITED

20 Longueuil Lane Montreal, Que.

CRANE MALLEABLE FITTINGS

CRANE

LIMITED

HEAD OFFICE & WORKS

1280 ST PATRICK ST

MONTREAL

BRANCHES: Toronto, Winnipeg, Vancouver.
SALES OFFICES: Halifax, Quebec, Ottawa, Calgary.

BOLT, NUT, FORGING AND WIRE NAIL MACHINERY

"National" Bolt Cutters, "Wedge Grip" Bolt and Rivet Headers, Forging Machines, Nut Machines, Roll Threaders and Wire Nail Machines are used by leading Railroads and Industrials.

THE NATIONAL MACHINERY CO TIFFIN, OHIO, U.S.A.

CANADIAN AGENT

H. W. PETRIE, Ltd.

TORONTO, ONT.

MONTREAL, QUE.
VANCOUVER, B.C.

IMPORTERS OF
INDUSTRIAL DIAMONDS
Goods Submitted on Memorandum if Desired
JOHN W. GORDON, Manager
5 James Street, ST. CATHARINES, ONTARIO

WHEEL TRUEING TOOL CO.
DETROIT

MANUFACTURERS OF
DIAMOND POINTED TOOLS
All Mountings Fully Guaranteed
Office and Factory:
88 West Pitt Street, WINDSOR, ONTARIO

Write for Catalog
WILLSON GOGGLES
Factory in Reading, Pa.

PRESSES and SHEARS
Sheet Metal Working Machinery
THE D. H. STOLL CO., INC.
26 Lansing St., BUFFALO, N.Y.

WELDING AND CUTTING
DAVIS APPARATUS
DAVIS-BOURNONVILLE CO.
"MADE IN CANADA"
Oxy-Acetylene Process

DAVIS-BOURNONVILLE COMPANY
Welding and Cutting Apparatus
TORONTO, ONTARIO
Factory and Sales Offices: 32-34 Eastern Ave.
MONTREAL, QUEBEC
Sales Offices: Coristine Building.
UNITED STATES
Factories and General Offices: Jersey City, N.J., U.S.A.
Branches in Principal Cities of the United States and in Foreign Countries.

Miller Bros. & Sons, Limited
Founders, Machinists, Millwrights and Engineers
120 Dalhousie St., Montreal

VICTORIA Special Machinery
DESIGNS PATTERNS
CASTINGS FORGINGS
Send for Catalogue
Victoria Foundry Co., Limited, Ottawa, Canada

DARLING BROTHERS, LIMITED
Engineers, Manufacturers and Founders
120 Prince Street, MONTREAL, P.Q.
Pumps for any Service—Steam Appliances—Freight Elevators—Webster Vacuum Heating System.

DIE-CASTINGS
ACCURACY—SERVICE
FMCo
Fisher Motor Co., Ltd.
ORILLIA - ONTARIO

NORTON JACKS
FOR ALL KINDS OF HEAVY LIFTING
Send for complete catalogue showing 50 styles 10 to 100 tons capacity.
Made only by **A. O. NORTON, Limited**
Coaticook, Prov. Quebec, Canada

40% DISCOUNT
On Combination Pulleys
from Wood Pulley List.
Positive Clutch & Pulley Works, Ltd., Aurora

PRESSES—ALL TYPES
AUTOMATIC BAIRD MACHINERY
Press Attachments, Automatic.
Metal and Wire Forming Machines.
Tumblers—Large Line.
Burnishing Machines. Grinders.
Special Machines.
Baird Machine Co., Bridgeport, Conn., U.S.A.

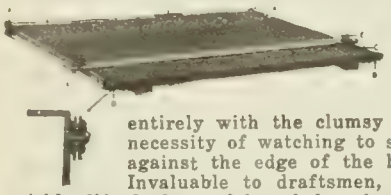
SHEFFIELD ENGINEERING SUPPLIES LIMITED
"DORMER" BRAND
H. S. DRILLS REAMERS STEEL
MILLING-CUTTERS FILES HACK-SAW BLADES
"Safety" Plastic Metallic Packing
230 CRAIG ST. W. MONTREAL, CANADA

Monel Metal Castings
For Anti-Corrosive and Superheat Service
Made in Canada by
CANADIAN DRIVER-HARRIS CO.
CHICAGO
WALKERVILLE, ONT.
CANADA
HARRISON N.J.
MANCHESTER ENGLAND

WE MANUFACTURE RIVETS of every description, 5/8 inch dia. and smaller

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

"ECONOMY"
Parallel Ruler Attachment



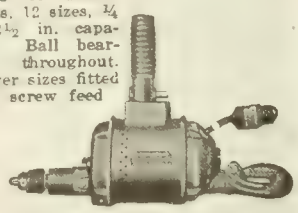
A simple arrangement which does not interfere with work on the drafting board in any way. It does away entirely with the clumsy "T" square and the necessity of watching to see that it is always against the edge of the board.
Invaluable to draftsmen, absolutely accurate, quickly lifted clear of board for changing drawings.

May we send circular giving full particulars?

Economy Drawing Table & Mfg. Co.
ADRIAN, MICH.

"Cincinnati Electrics"
Cut Your Costs

Hand or Breast Drills, 12 sizes, ¼ to 2½ in. capacity. Ball bearing throughout. Larger sizes fitted with screw feed



We make complete line of Portable Electric Drills and Grinders for all purposes. Especially built to withstand hard usage. For all currents and voltages. Catalog?

Cincinnati Electric Tool Co., Cincinnati, Ohio

SPRING SHACKLE BOLTS

Complete Line of Oilers, Oil Cups, Brass Dowel Pins and Pressed Steel and Brass Grease Cups All Types

Write for catalogues and prices

THE CANADIAN WINKLEY CO.
Limited
WINDSOR - ONTARIO

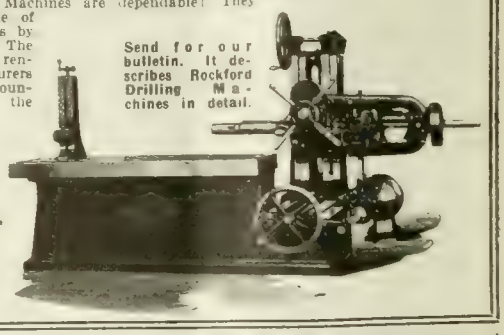
"D" PLAIN

ROCKFORD DRILLING MACHINES

Note the lateral and vertical adjustment of this Rockford Drilling Machine. It operates anywhere on a surface 18" high by 36" wide!

Rockford Drilling Machines are dependable! They are carefully made of the finest materials by skilled workmen. The service they are rendering manufacturers throughout the country proves that the design is right.

Send for our bulletin. It describes Rockford Drilling Machines in detail.



The Rockford Drilling Machine Company
Rockford, Ill., U.S.A.

Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal.

McFarlane's Belt Dressings
FOR ALL TYPES OF BELTS

Leather, Canvas, Balata, Cotton, etc.

Preserves the Belts, prevents slipping, jumping, stretching and fraying.

Ensures highest efficiency in transmission of power.

Burgess & Marchand
614 Drummond Bldg. - MONTREAL

DROP FORGINGS

Medium or light of any description, from 8 lbs. in weight down to the smallest.

Our modern equipment and skilled organization enable us to guarantee satisfactory quality and service.

We solicit your enquiries with drawings or samples, for our prompt quotations.

The STEEL COMPANY OF CANADA, Limited
HAMILTON TORONTO MONTREAL

Canadian Steel Foundries Need Frost Improved Sand Mills

WINNING FEATURES

Heavy Mullers
Unloading Device
Motor or Belt Drive

The Frost Mfg. Co.
112 W. Adams St., Chicago

Eclipse INTERCHANGEABLE
Standard Tools

Interchangeable Counterbores, Core Drills, Connecting Rod Cutters, Countersinks, Inverted Counterbores, Spot Facers, Adjustable Length Holders.

Eclipse Counterbore Co., Ltd.
Walkerville, Ontario

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use

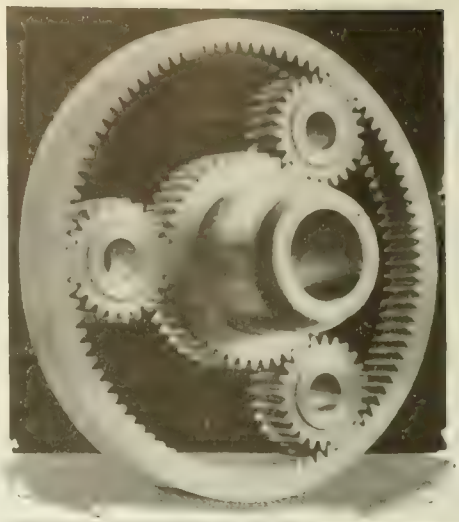
The Correct Belt for Every Drive

Flat and Round Belting, Leather Packings, Gaskets, Washers, Lace Leathers, Belt Dressings and Cements. Protective Aprons and Hard Leathers.

Canadian Graton & Knight, Ltd., 84 St. Antoine St., Montreal, Canada
Representatives in Canada: Canadian Fairbanks-Morse Co., Limited

Oak Leather Tanners
Makers of Belts and Other Leather Products

Distributors and Branches in All Principal Cities

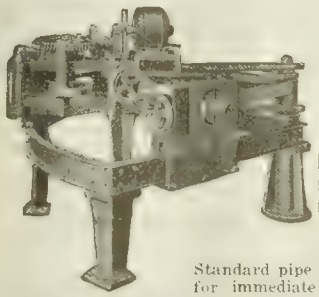


CUT GEARS

Hamilton Gear & Mach. Co.

Van Horne St.
TORONTO

"WONDER"



Cold Pipe Benders

Standard of the world

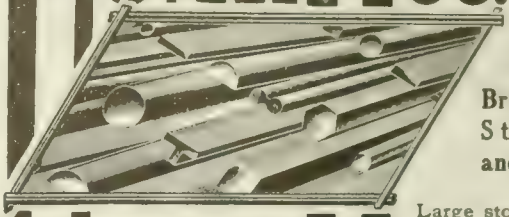
Bends all sizes of Pipe from $\frac{1}{8}$" to 8" hand or motor operated.

Send for Catalog

Standard pipe bends 1" to 6" pipe in stock for immediate delivery.

American Pipe Bending Machine Co.
52 Pearl St., Boston, Mass., U. S. A.

UNION DRAWN STEEL CO. LTD.



Manufacturers of
Bright Finished Steel Shafting and Shapes.

Large stock of all sizes.

Send for Price List

HAMILTON, ONTARIO

GEARS AND PINIONS

Any Kind of Gear

We make a specialty of rawhide and silent Micarta Pinions for noiseless drives.

"Hurry Orders and Break-Down Jobs" receive special attention. Try a catalogue—it's interesting, and contains a lot of gear data.

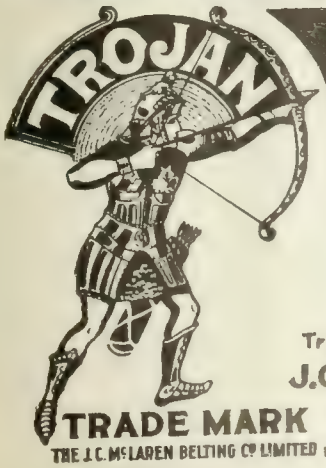
Philadelphia GEAR Works
Vine St., Philadelphia, Pa.

SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE
Canadian Drawn Steel Co.
LIMITED
HAMILTON CANADA



A BALATA BELTING

Which We Guarantee Second To None And Entirely Satisfactory

Try One And Be Convinced

J.C.McLAREN BELTING CO.
Limited
MONTREAL TORONTO WINNIPEG

TRADE MARK
THE J.C. McLAREN BELTING CO LIMITED

CURTIS

CRANES

Write for illustrated literature giving full information.

CURTIS
Pneumatic Mach. Co.
1565 Kienlen Av., St. Louis
[illegible] Hudson Term., N.Y.C.

Wheels Equipped With Hyatt Flexible Roller Bearings.

If interested tear out this page and place with letters to be answered.

Are You Inquisitive?

If not, do not pay any attention to this.

If you are, look on page 81.

SPECIAL MACHINERY

36" Fallows Gear Shaper

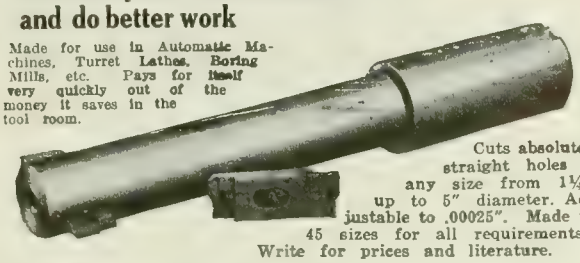
indicates the complete and modern equipment throughout our Gear Department. Send your custom work to us.

MADE IN BRENCO CANADA

Brown Engineering Corporation
LIMITED, TORONTO
415-419 King St., W. Tel. Adel. 425

Madison Adjustable Boring Cutters and Bars
Take the place of REAMERS and do better work

Made for use in Automatic Machines, Turret Lathes, Boring Mills, etc. Pays for itself very quickly out of the money it saves in the tool room.



Cuts absolutely straight holes of any size from 1¼" up to 5" diameter. Adjustable to .00025". Made in 45 sizes for all requirements. Write for prices and literature.

MADISON MANUFACTURING COMPANY
MUSKEGON, MICHIGAN, U.S.A.

STEEL CASTINGS

We shall be glad to supply, in addition to our General Catalogue, literature on

Steel Castings	Lithographed
Galvanizing	Ware
Wire Goods	Enamelled
Stoves	Signs

Made by the Acid Electric process up to fifteen tons. Castings made by this process are free from blow holes, easy to machine, and superior in every way to ordinary Steel Castings.

Castings supplied for shipbuilding, cars, locomotives, all classes of machinery, etc.

Head Office: Montreal.
Branches: Toronto and Winnipeg.
Steel Foundry Division:
Lachine Canal, Turcot.

The Thos. Davidson Mfg. Co., Ltd.

DAVIDSON

Have You Business Information on File?

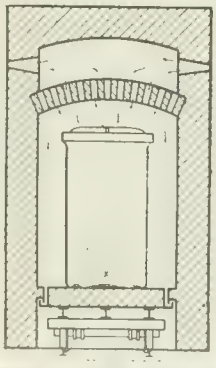
Our service brings to your desk interesting news collected from the newspapers, relating to your business.

Often you plan your affairs on market conditions and new developments, but you could plan much better with full information before you from the whole of Canada and United States.

These newspaper clippings have proven most valuable to business houses, saving time in searching files and often being turned to good account getting orders and contracts through these leads.

As an aggressive firm you would be kept in constant touch with all activities affecting your line of business. You can use this business data on industrial conditions, crop reports, factory expansions, fire losses, insurance news and trade changes. Consult our service man—he can suggest a service that will save you time and solve your problems.

Canadian Press Clipping Service, 143-153 University Ave., Toronto



car furnace, showing tendency to of cold zone (X) at bottom, due to comparatively cold hearth.

Uses and Limitations
OF
Car Type and Car-and-Ball Type Furnaces
are clearly defined in Bulletin 222-T

W. S. ROCKWELL CO. INDUSTRIAL FURNACES NEW YORK ESTABLISHED 1888

Typical installations are shown to illustrate—

The applicability of car type and car-and-ball type furnaces to the heat-treatment of material that cannot be advantageously handled in other types of furnces.

Factors governing selection of the type (car or car-and-ball) best suited to individual manufacturing requirements.

Difference in design of each type.

Influence of unequal cooling on the quality of finished product.

In brief, this bulletin is a discussion of principles which will appeal to those interested in furnace design, loading and handling methods, heat generation and utilization, etc.

Write for Bulletin 222-T to Canadian Representative.

W. S. ROCKWELL COMPANY
Furnace Engineers and Contractors
50 Church St. (Hudson Terminal Bldg.), New York
"Furnace and Fuel to Suit Conditions"
Canadian Representative: R. J. McLean, 604 Southam Bldg., Montreal, P.Q.

A Stirring Instalment of Heming's Famous Story

ARTHUR HEMING continues his remarkable story of Canada's Northland in March 1 MACLEAN'S MAGAZINE. In "Wild Animals and Men" he tells how he and Oo-Koo-hoo tracked and trapped wolverine, lynx, and other wild animals, and tells fascinating stories of battles of wits between the hunters and the hunted. The wiles of the Indians and half-breeds are pitted against the amazing, almost superhuman craftiness of the animals—and sometimes the denizens of the forest wilds outwit their human antagonists.

Fun at Opening of Parliament

J. K. Munro sat in his seat in the Press Gallery, Monday, February 14, when Parliament opened, and looked down with the good-natured tolerance and contempt of an iconoclast and a satirist at the proceedings. The members invariably amuse "J. K."; it takes a really big man to elicit more than scant praise from his sophisticated pen. His March 1 article is entitled: "Funny, as the Owl is Funny."

Other Big Features and Fiction

"Canada's Fur Future," by Agnes C. Laut. Telling what a potential gold mine Canada has in her fur industry, properly conserved and exploited.

"Goldwin Smith," by James Mavor, Ph.D. The personal side of the "Sage of the Grange," the man who was tutor to King Edward VII, before coming to Canada.

"More Political Memoirs," by Col. George H. Ham. Further stories of the "Solons of the Eighties," and Ottawa 30 or 40 years ago.

"Pawned," by Frank L. Packard. The story of a triple regeneration—in this instalment John Bruce declares his love for the "Pawnshop Girl."

"The Man Who Knew Too Much: The Bottomless Well," by Gilbert K. Chesterton. This Near-Eastern well and a revolving bookcase figure in a baffling murder story, handled by England's master of fiction.

"The Lady at His Door," by Barker Shelton. A girl takes a law course, graduates—but that doesn't mean clients. But she gets a partner—and for life.

"The Millionth Chance," by Henry Holt. An Adventurous sea story, with a girl skipper and a man who won her respect—and even her love.

Review of Reviews

Split Among the Socialists— Joseph Gollomb

New Wonder City— Agnes C. Laut

Where Humanity Started— New York "Times"

World's Worst Failure?— Harold Trowbridge Pulsifer

Birth Control and War— Harold C. Cox

A Pugilistic Apollo— Heywood Broun

MARCH 1st ISSUE on All News-stands 20c

MACLEAN'S

"CANADA'S NATIONAL MAGAZINE"

Name of Hardware Merchant and further details, supplied upon request

The Answer is—He Didn't!

THE crowd was drawn by a hardware firm in an Ontario town of 700 population. This crowd of over 1,000 people represents customers of the store, drawn from miles around, to attend the picnic given by this firm to its customers. Surely this is evidence of the close relationship between this hardware firm and its customers.

The close relationship between retailer and customer in this instance is typical of conditions existing in hundreds of Canadian towns, villages and cities.

The average hardware merchant (particularly in the smaller cities and towns) has been established for many years. He has a big business connection built up through years of efficient service to his customers. He is well rated, and a desirable man with whom to do business. He influences the buying habits of the people in his community, and in over 90% of the sales made, he is the deciding factor.

"*Which one do you recommend?*" is a question asked thousands of times each day in the hardware stores of Canada.

If you can get the effort and enthusiasm of the retail hardware merchants and their clerks, plus their window and interior displays and local advertising behind your goods, you will have secured the co-operation of one of the greatest available selling forces.

HARDWARE AND METAL is paid for, and read, by all the wholesale hardware buyers of Canada, and over 90% of the retailers from coast to coast. They are the men who control the sale of your products to the hardware consumers. HARDWARE AND METAL can put your story before, practically, the entire Canadian hardware trade. One of our representatives would be glad to give further details.

(Only hardware paper in Canada with membership in the Audit Bureau of Circulations).

HARDWARE & METAL

Canada's National Hardware Weekly since 1888

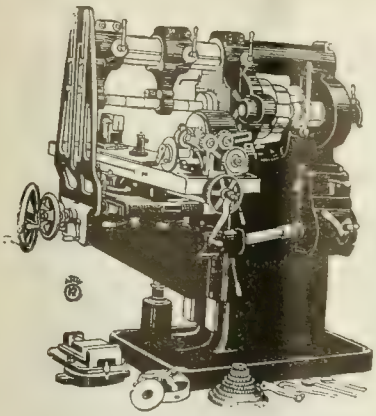
143-153 University Avenue - - Toronto, Canada

Published every Saturday since 1888. The only weekly hardware paper in Canada, and the only hardware paper in Canada that gives you a circulation statement audited by the Audit Bureau of Circulations

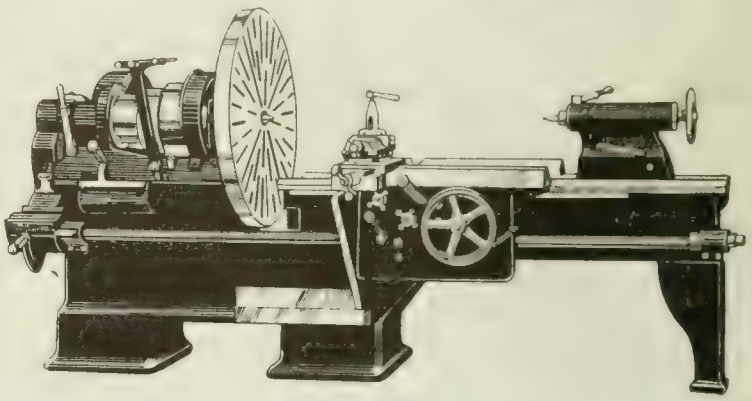
Montreal Branch, Southam Building **Winnipeg Branch, Union Trust Building**

Machine Shop and Pattern Shop Equipment

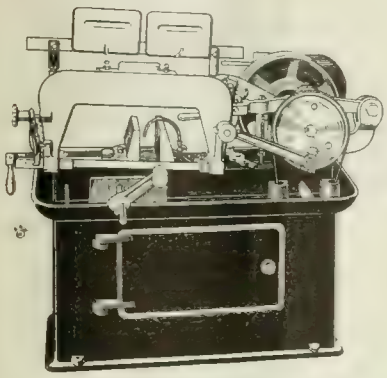
NEW AND USED



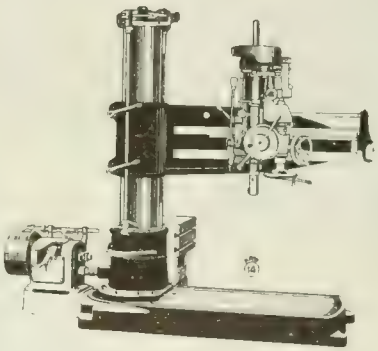
LeBlond No. 2 Universal Miller



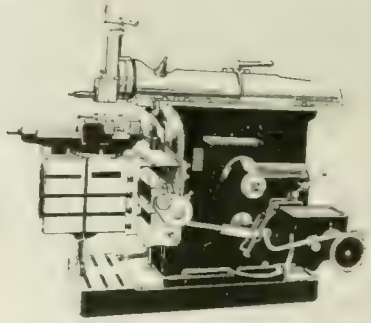
Gap Lathe



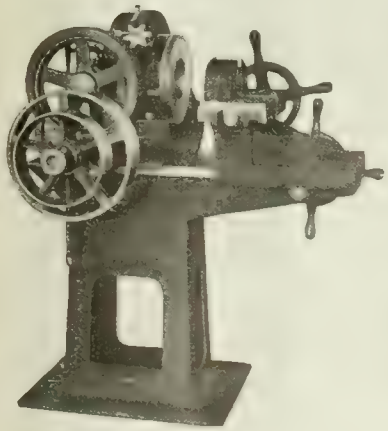
6 x 6 High Speed Hack Saw



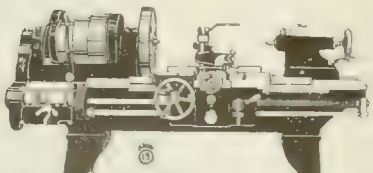
4 ft. Fosdick Radial Drill



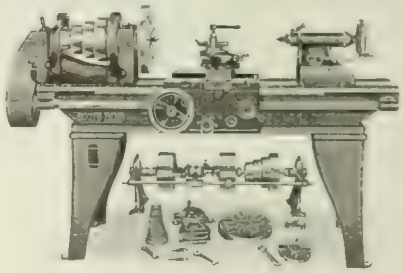
24 in. Gould & Eberhardt Shaper



4 in. Pipe Machine



19 x 8 LeBlond Heavy Duty Lathe



16 x 8 South Bend Lathe

Used Equipment Rebuilt and Guaranteed Equal to New

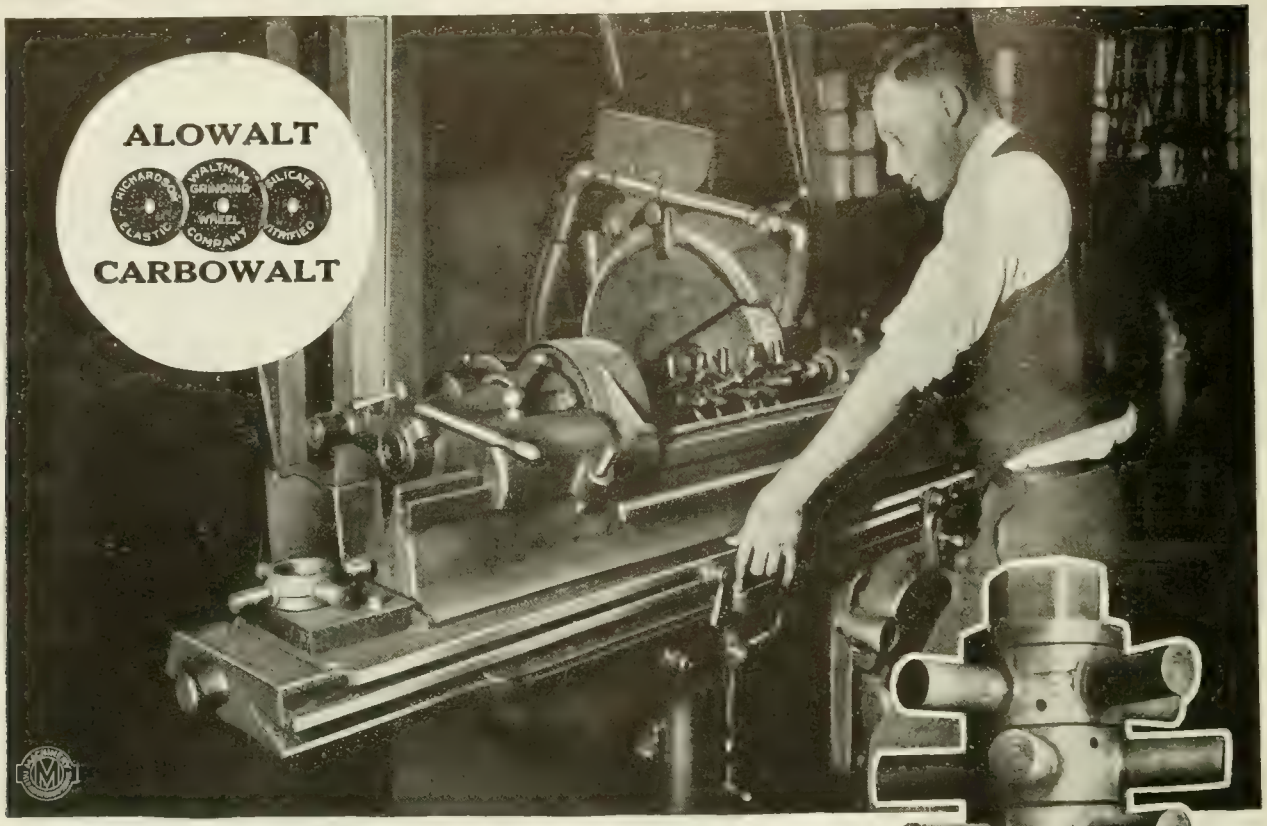
Wire, write or phone for prices

A. R. Williams Machinery & Supply Co., Limited

320-26 St. James Street - Montreal

Phone Main 5200

HALIFAX ST. JOHN TORONTO WINNIPEG VANCOUVER



WALTHAM

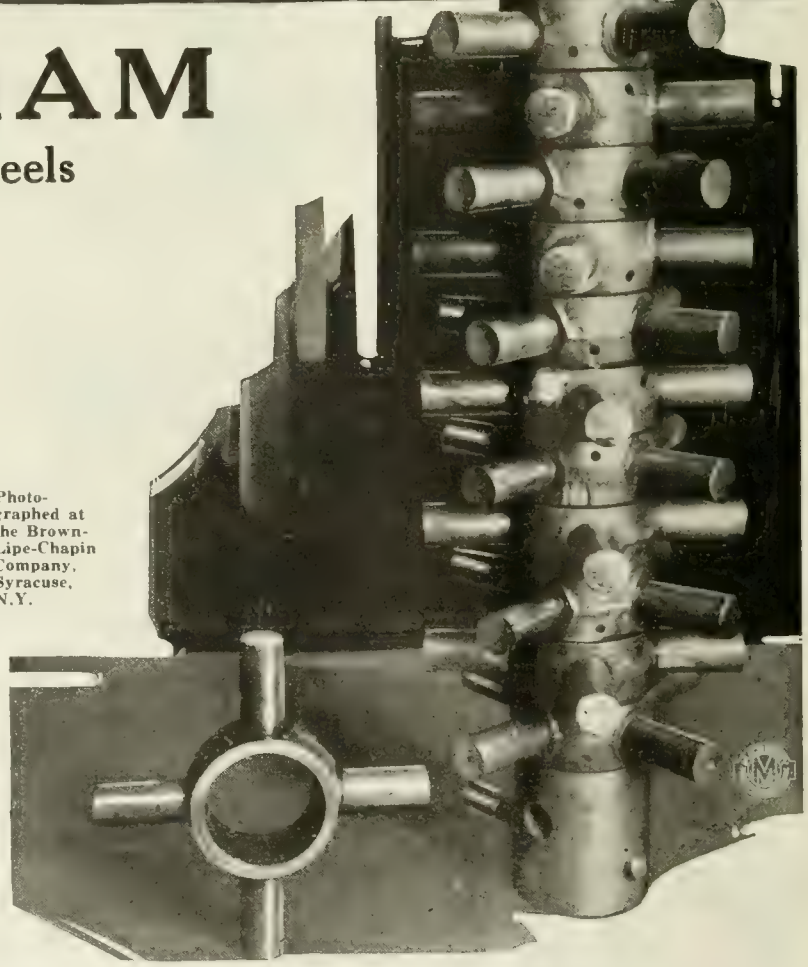
Alowalt Grinding Wheels

Best to Break Through the Case on These Forgings

The parts are case hardened forgings for 6″ differential gear cross arms. These are mounted on an arbor and set up as for cylinder grinding (see photograph), a method of handling the work that makes severe demands on the wheel. Arms are ¾″ in diameter and about 1-16″ of stock is removed.

After many tests a Waltham No. 346L. Special Alowalt Grinding Wheel 18″ diameter, 2″ face, was selected for this job and is now used exclusively. Production averages 90 per hour.

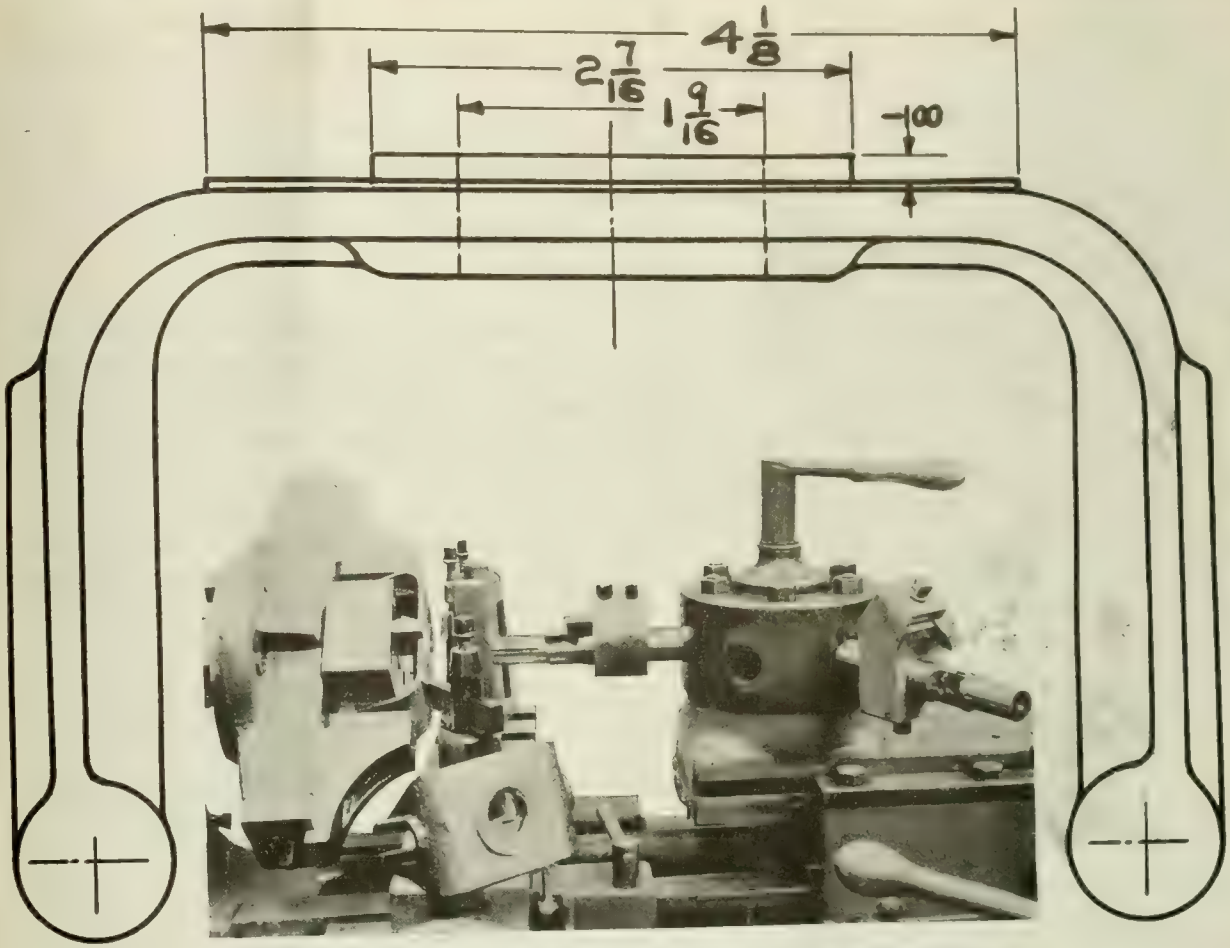
There's a Waltham for every job, no matter how tough or how delicate. Put your grinding problem up to us. We're here to help.



Photographed at the Brown-Lipe-Chapin Company, Syracuse, N.Y.

Waltham Grinding Wheel Co.
of Canada, Limited
Brantford, Ontario

Eastern Representative: Standard Machinery & Supplies Ltd., Montreal, Que.



W & S 16" Geared Friction Head Turret Lathe tooled to finish Torque Arm Brackets

Be Ready for Increasing Business

Remember there are no obligations attached to the engineering services we offer you. If we cannot help you we tell you so. But—we have helped others to increase the earning capacity of their turret lathe equipments and are ready to try to help you if you wish.

We've had forty years' experience making and tooling turret lathes to satisfy unusual demands. Draw on our experience and be ready for the business increases which are bound to come soon.

Write us and we'll send an engineer to consult with you, or send us blueprints and samples of your work for estimate.

World's Largest Manufacturer of Turret Lathes and Turret Lathe Tools

The Warner & Swasey Company

CLEVELAND, U.S.A.

BRANCH SALES OFFICES:
Buffalo: Iroquois Building
New York: Singer Building
De'roit: Ford Building
Boston: Oliver Building
Chicago: 618-622 Washington Boulevard

CANADIAN AGENTS—
A. R. Williams Machinery Company, Ltd., Toronto, Winnipeg, Vancouver, St. John.
Williams & Wilson, Ltd., Montreal.

FOREIGN AGENTS
Charles Churchill & Company, Ltd., London, Birmingham, Manchester, Bristol, Newcastle-on-Tyne, Glasgow.
Allied Machinery Company, Paris, Turin, Zurich, Barcelona, Brussels.
Wilhelm Sohlstrom Company, Malmo, Copenhagen, Stockholm, Gothenburg.
R. S. Stokvis & Co Zonen, Rotterdam.
Benson Brothers, Sydney, Melbourne, Adelaide.
Yamatake Company, Tokyo, Osaka, Nagoya, Fukuoka, Daiven.
McLeod & Company, Calcutta.
Andersen, Meyer & Company, Ltd., Shanghai.
Brossard-Mopin & Company, Saigon, Singapore, Haiphong.

... reserved.

WHEN THINKING
OF BELTING
KEEP IN MIND THAT

The back of the OX

is the part where the fibre of the hide is tightest and unaffected by the action of breathing, therefore the most suitable to produce a dead straight and practically stretchless belt.

Tullis
LEATHER BELTING
COLUMBIA BRAND

is made entirely from this portion of the hide.

SEND FOR OUR ILLUSTRATED CATALOGUE

JOHN TULLIS & SON, LTD.
BELTING SPECIALISTS
ST. ANN'S WORKS, GLASGOW, SCOTLAND
Established 1834

Canadian Agents:
UNIVERSAL SUPPLIES Limited
Room 25, 204 St. James Street
MONTREAL

Examine the Grain!

A properly alloyed babbitt has a perfectly uniform grain.

Break a bar of the babbitt you are using—

If you find the grain irregular—if it shows a mixture of fine and coarse particles—if it shows a separation of layers—one dark and one light in color—

then you may know that it is poorly alloyed—and that you can get far better wear from

Lionroyal

produced by the STANLEY PROCESS of alloying.

Lionroyal is clean—uniform—dense grained—and durable.

It is copper-hardened and tin-toughened. Bearings lined with it carry the load evenly—every inch of bearing surface equally durable.

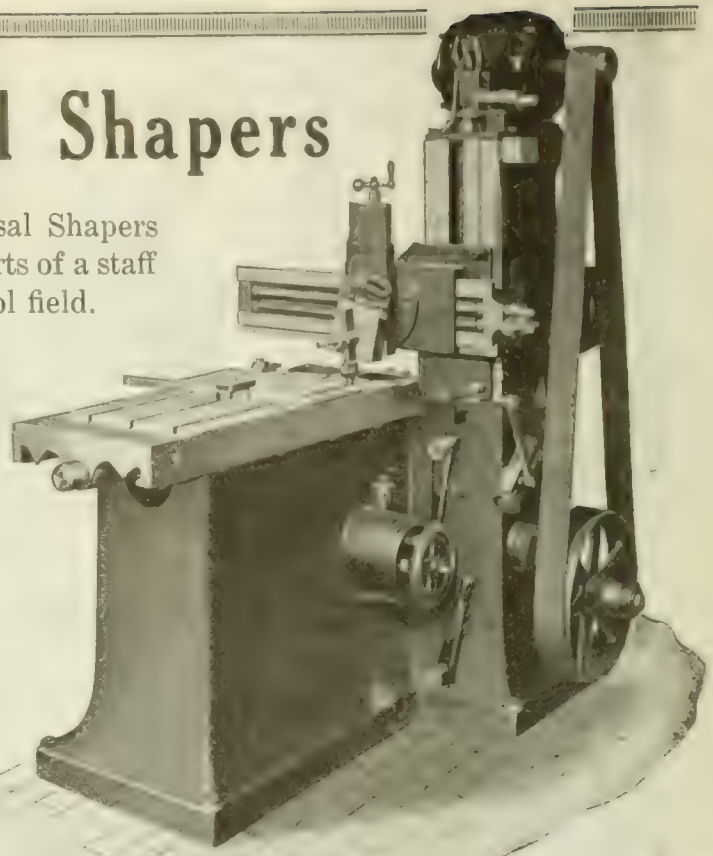
It has no hard spots of copper or antimony, because the hard elements are thoroughly and uniformly amalgamated with the tough elements. This fact bespeaks steady service and long wear.

Write for booklet "AB" to know more about pouring and using Babbitt.

BRITISH SMELTING & REFINING COMPANY LIMITED
MONTREAL

24-inch Universal Shapers

Into the design and construction of Universal Shapers have gone the united knowledge and best efforts of a staff of specialists in the tool, jig and machine tool field.



Consider these features—

It planes parallel in the heaviest cuts.

It planes accurately—horizontally as well as vertically.

It handles efficiently a wide range of shaper and planer jobs—particularly those considered awkward by **both** these machines.

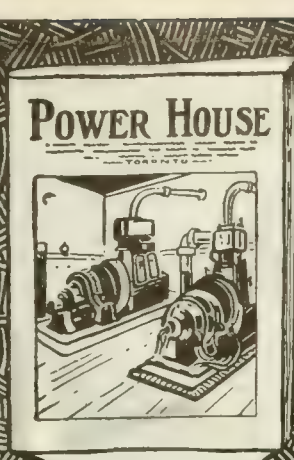
Operator can reach all adjustments from working position.

Have you full particulars?

Universal Machine & Tool Company

Canton, Ohio, U.S.A.

ACCURACY



The Influential Four

For Self-Promotion and Sales Promotion Use These Publications

CANADIAN MACHINERY
Weekly—$4.00 per year.
Covers the metal working field—serving shop executives, purchasing agents and owners. First-class mechanical paper and market paper combined.

POWER HOUSE
Twice a month—$2.00 per year.
Serves the power plant engineer—Steam, Electric Refrigeration, Hydraulic.

CANADIAN FOUNDRYMAN
Monthly—$2.00 per year.
A paper for the foundry owner, superintendent and foreman. Claimed by its readers to be unexcelled.

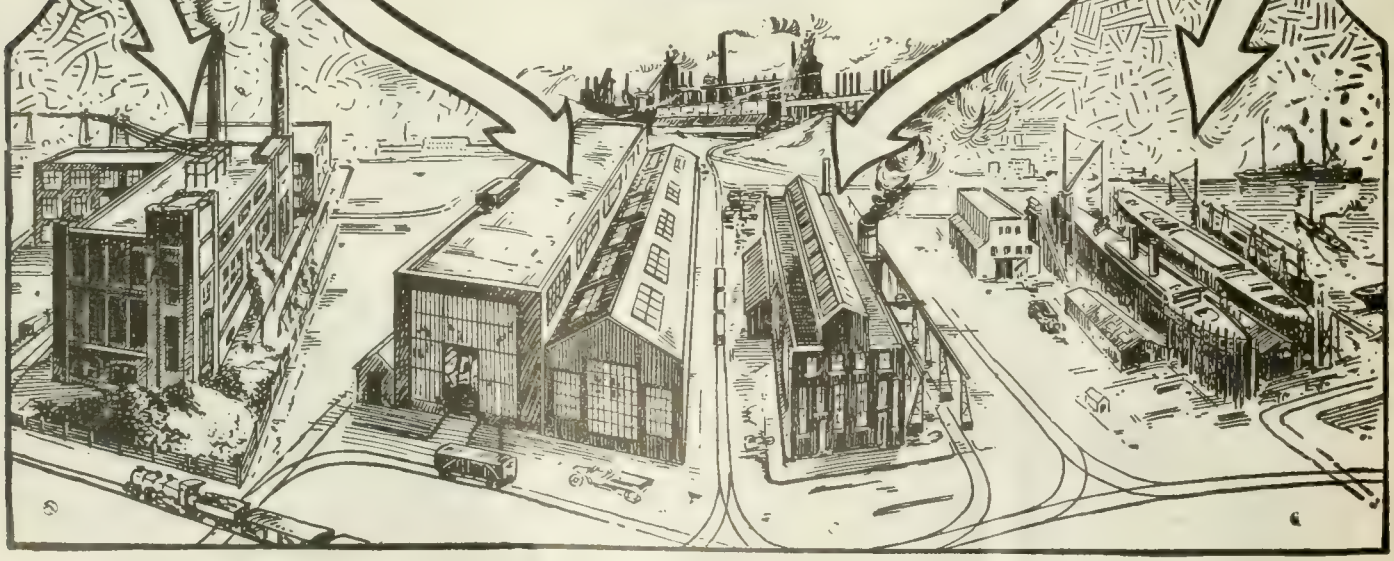
MARINE ENGINEERING
Monthly—$2.00 per year.
Interprets marine engineering in its broad sense, serving the ship builders, navigation companies and their officers. (The editor holds an extra first-class B.O.T. certificate).

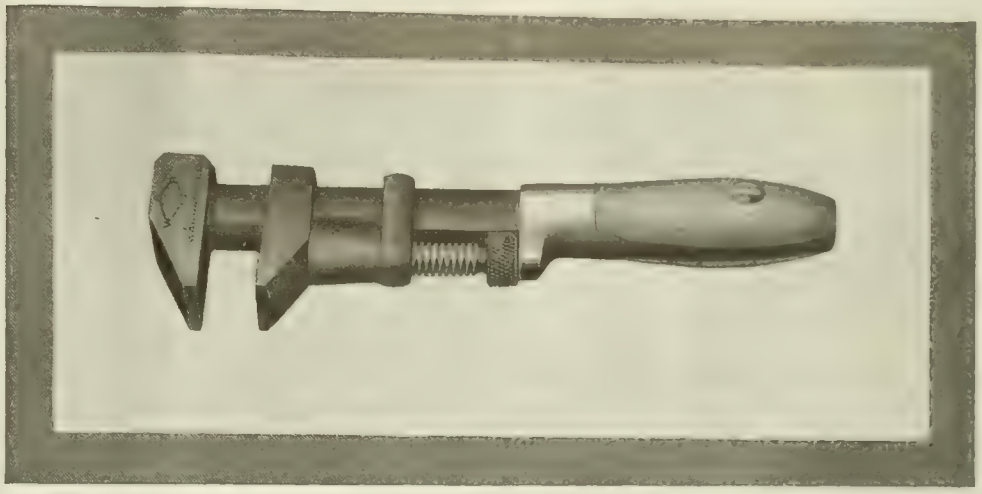
Published by

THE MACLEAN PUBLISHING COMPANY, LIMITED
143-153 UNIVERSITY AVE., TORONTO

A company whose idea of service has made it the largest concern of its kind in the British Empire.

Sample Copy and Advertising Rates sent upon request.





"W & B" Screw Wrenches are dependable *tools* for the heaviest duty because into each of their *parts* is put the skill and experience—the "know how"—gained during nearly half a century of wrench manufacture.

They contain no weak member. With head and bar drop-forged in one piece from specially selected steel, extra heavy jaw thoroughly case-hardened and an accurately made solid steel screw, each part contributes its individual share toward the assured, dependable strength of the completed tool.

Two models—"Railroad Special," with iron handle, and Machinists' Knife Handle, illustrated above, are the strongest and best heavy duty screw wrenches made. Seven sizes—6 to 21 inches.

A third model—"Agricultural"—is supplied at a lower price where the maximum of strength and service is not necessary. Five sizes—6 to 15 inches.

Ask for new book

J. H. WILLIAMS & CO.

LIMITED

"The Wrench People"

FORMERLY CANADIAN BRANCH OF
THE WHITMAN & BARNES MFG. CO.

45 Thorold Road **St. Catharines, Ontario**

DROP-FORGINGS
often cheaper than castings
— always far superior —

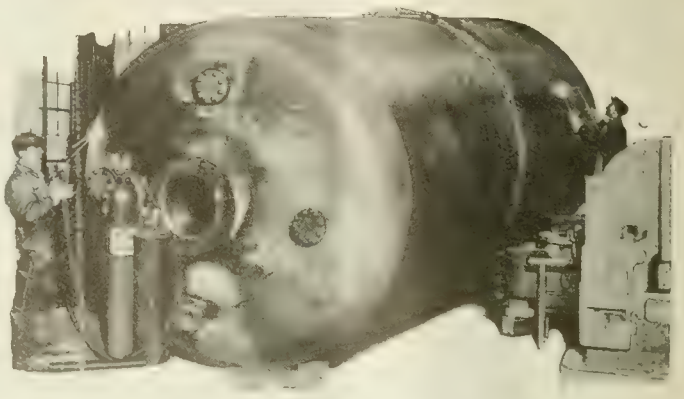
Leak Insurance

The Welded Tank answers ideally the demand of the industrial engineer for tanks which must be tight, strong and permanently leak-proof.

The oxy-acetylene process has made such tanks possible and

Prest-O-Lite

DISSOLVED ACETYLENE



because of its high quality and extreme portability has increased the usefulness of the welding and cutting torches a thousand fold.

Especially is this true wherever large, cumbersome sections are to be welded —Prest-O-Lite can readily be carried anywhere—it goes to the job.

Tank makers are assured of the highest quality of gas and a constant and unlimited supply by using Prest-O-Lite.

A chain of plants and warehouses is kept busy meeting the demand for this most useful of gases.

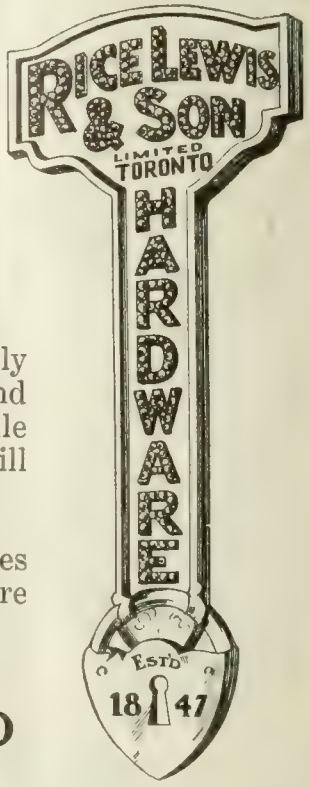
PREST-O-LITE COMPANY OF CANADA, LIMITED
Hillcrest Park, Toronto

Branches at: Montreal, Toronto, Winnipeg.
Plants at: Toronto, Ont.; St. Boniface, Man.; Merritton, Ont.; Shawinigan Falls, P.Q. PWC-529

Machine Shop, Foundry, Factory and Construction Supplies

We have been in the hardware and metal supply business for 74 years. Our products are well and favorably known throughout Canada. We handle only lines of proven reliability which we **know** will give satisfactory service to our customers.

We shall be glad to send you full particulars, prices and dates of delivery of those lines in which you are interested.



RICE LEWIS & SON, LIMITED
19 VICTORIA ST., TORONTO, ONT.

CANADIAN ATLAS CRUCIBLE STEEL Co. LIMITED

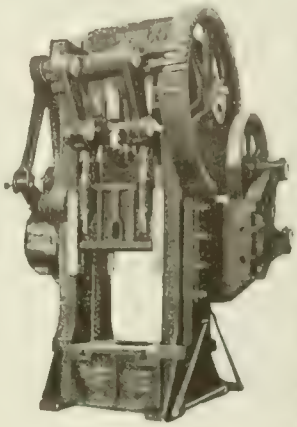
Made in Canada

L-XX HIGH-SPEED
ATLAS TOOL STEELS
ATLAS ALLOY STEELS

Hot Rolled, Forged Blocks and Discs
Cold Drawn Steel and Drill Rod

GENERAL SALES OFFICE:
133 Eastern Avenue, TORONTO, ONT.
Works: WELLAND, ONT
Sales Offices and Warehouses :
TORONTO, ONT. MONTREAL, QUE. WINNIPEG, MAN.

The "TOLEDO" TOGGLE DRAWING Presses



Their reliable performance under all conditions — the cumulative gain in production — the great decrease in cost of both upkeep and production are some of the reasons for the progressive success of these presses. The patented toggle mechanism is notable for simplicity and effectiveness. We solicit the opportunity of placing the details of construction before you.

THE TOLEDO MACHINE & TOOL CO.
TOLEDO, OHIO

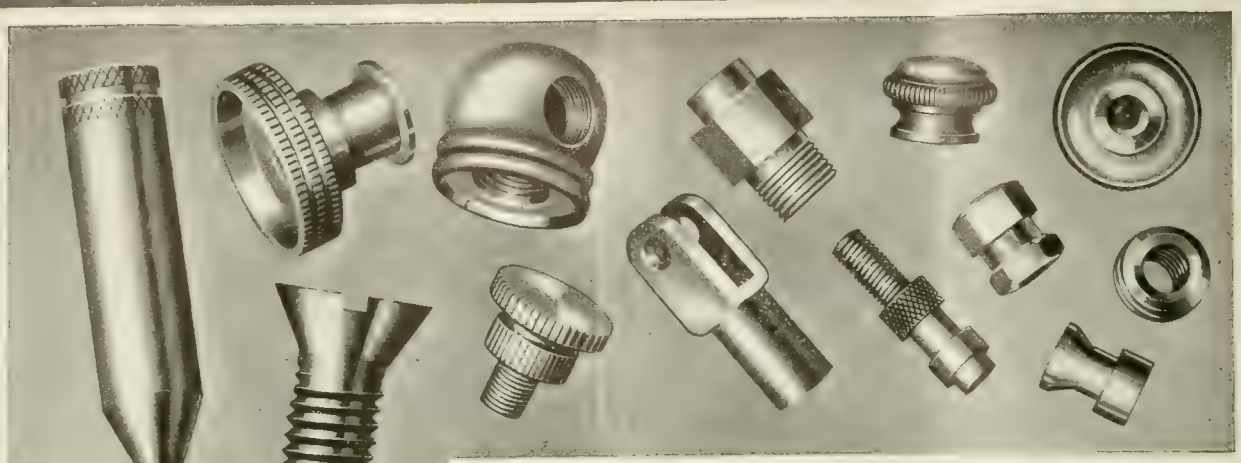
"Hisco" Machine—Molded Gears

The fact that "Hisco" Machine Molded Gears require no pattern is a factor of considerable importance when the price of lumber and labor is so high. "Hisco" quality insures accurate, dependable gears. Remember the price of "Hisco" gears does not include the cost of patterns.

We are also manufacturers of Steel, Chrome, Manganese and Nickel Steel Castings, Annealed and Unannealed; Cement Mill and Mining Machinery; Castings; Stamp Mills; Crushing Plants; Excavating Outfits; Steel Car Wheels; Locomotive Driving Wheels and Frames, etc.

Let us know your requirements and we do the rest.

Hull Iron & Steel Foundries, Limited
HULL, Quebec



When Production speeds up again—how about those Small Parts?

It's time to analyze your product and your buying carefully—especially those important *parts* upon which so much depends.

Let's get together. We can give you some invaluable ideas on screw machine products and assemblies. There's hardly space here to tell the whole story, but ask a brother P. A. about "Barnes-Made" Parts, Barnes Assemblies, Barnes Special Engineering Service, Barnes Quality and Barnes Deliveries.

We're ready when you are.

Springs of steel, brass phosphor bronze or vanadium flat, coiled, spiral compression extension or torsion Wire Forming. Spring Washers. Small Parts of steel, brass, etc., in any finish. Assemblies. High Carbon Cold Rolled Steel.

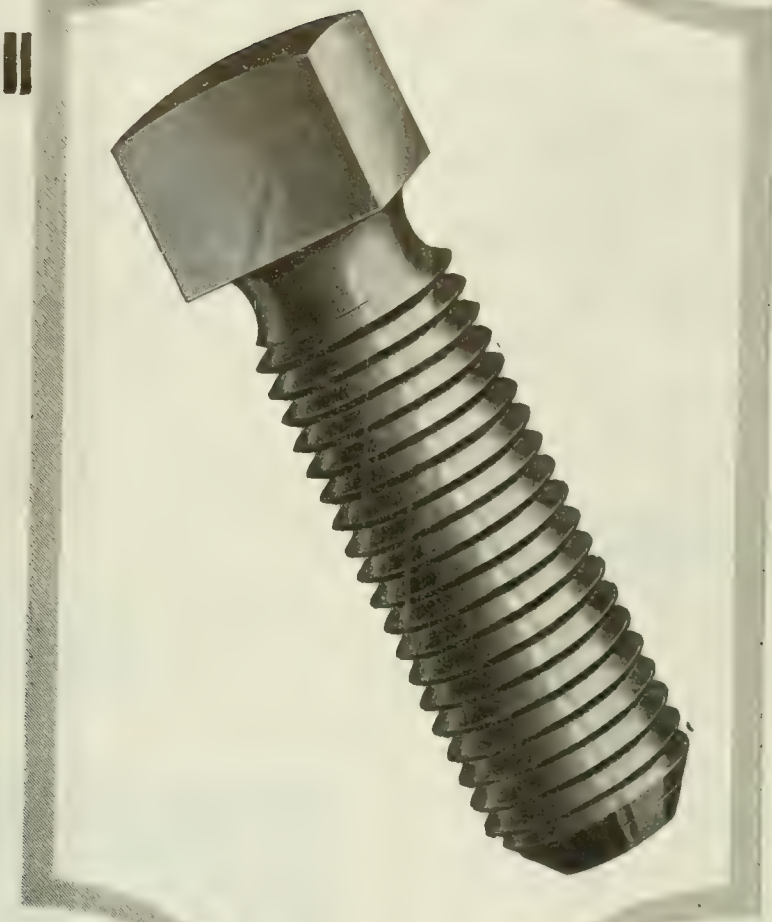
The Wallace Barnes Company

"Spring Makers for Three Generations"

Main Office and Works:
Bristol, Conn.

Western Sales Office:
Book Bldg., Detroit

If interested tear out this page and place with letters to be answered.



STANDARD

S.A.E. Plain & Castellated Nuts
V., U.S.S. & S.A.E. Cap Screws
V., & U.S.S. Semi-finished Nuts
V., & U.S.S. Set Screws

SPECIAL

Screw machine product up to 2¼" diam., to specifications.
Hardened and ground product to specifications.

THE NATIONAL ACME COMPANY

MONTREAL, P.Q.

De Courcelles **G.T.R.R.**

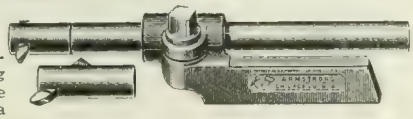
If interested tear out this page and place with letters to be answered.

Armstrong Boring Tools

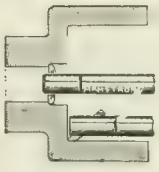
Require no forging or tempering and very little grinding. They are always ready for use, are very stiff and will bore close up to a shoulder or bottom.

1=12

One Armstrong Boring Tool will take the place of a dozen forged boring tools.



No.	Size Shank Inches	Diam. Bar Inch	Size Cutter Inch Sq.
00B	5-16x 3-4	1-2	3-16
8	3-8 x 7-8	9-16	3-16
9	1-2x1 1-8	3-4	1-4
10	5-8x1 3-8	15-16	5-16
11	3-4x1 5-8	1 1-8	3-8
12	7-8x1 3-4	1 5-1 6	7-16
13	1 x2	1 1-2	1-2

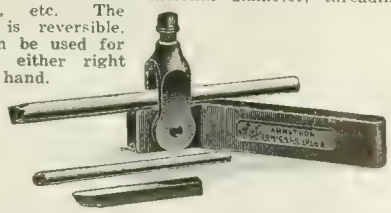


This cut shows Double-Ended Cutter roughing out cored hole; also angle cutter boring and facing end.

Armstrong Boring Tool Holder

Patented

This tool will be found very handy in the Tool Room or in boring work of small internal diameter, threading, brass turning, etc. The holder is reversible, and can be used for turning either right or left hand.



No.	Size of Shank Inches	Size of Bars Furnished Diam. Inches	Size of Square Cutter Inches
15	3-8 x 3-4	1-8 and 1-4	1-4
16	1-2 x 1	3-16 and 5-16	5-16
17	5-8 x 1 1-4	1-4 and 3-8	3-8
18	3-4 x 1 1-2	5-16 and 7-16	7-16

Refuse Imitations

Armstrong Tools Are carried in Stock by Practically All Canadian Supply Houses

Send for a copy of our complete catalog

ARMSTRONG BROS. TOOL CO.

"THE TOOL HOLDER PEOPLE"

N. FRANCISCO AVE. CHICAGO, U.S.A.

STEEL CASTINGS

QUICK DELIVERIES

High Carbon Steel
Manganese Steel
Chrome Steel
Mild Steel

QUALITY GUARANTEED

Sizes—½ lb. to 5,000 lbs. each

THE WILLIAM KENNEDY & SONS,
LIMITED
OWEN SOUND, ONTARIO
ESTABLISHED 1860

DIAMOND TOOLS

FOR TRUEING GRINDING WHEELS

QUALITY SERVICE SATISFACTION

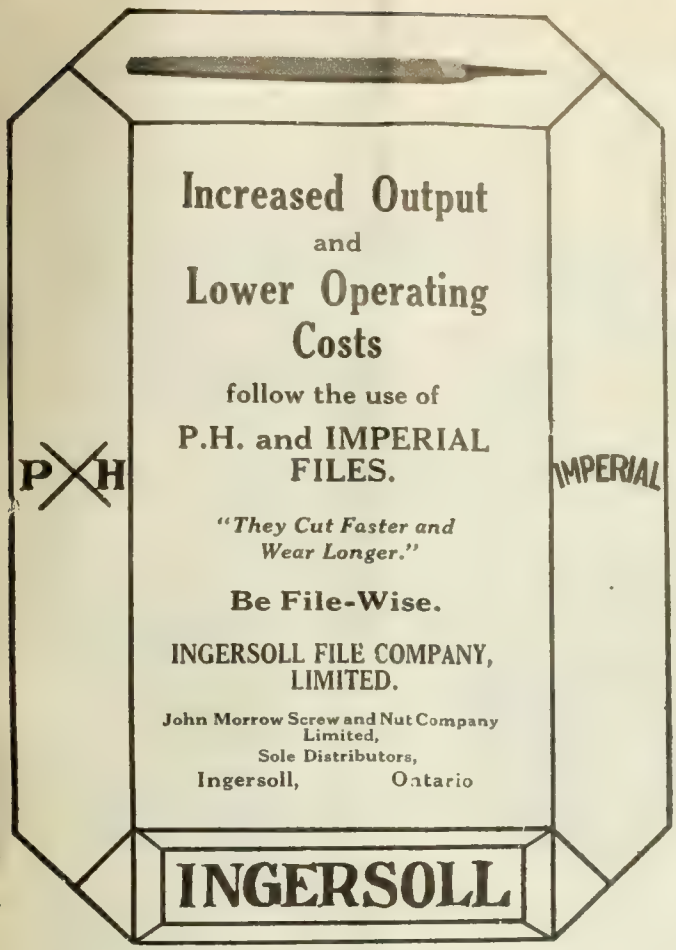
INDUSTRIAL GEMS

Tools For All Mechanical Purposes

FURNISS CLARKE & COMPANY
364 University St.
MONTREAL

Sole Canadian Agents for

THE JOYCE-KOEBEL COMPANY, INC.
Formerly Geo. A. Joyce Co., Ltd.
NEW YORK LONDON



TOOL GRINDING CHART

Showing clearance and rake angles for cutting tools. 17 x 27½ inches, printed in two colors on heavy manilla stock.

A splendid thing for any tool room. One large engineering firm, in acknowledging this chart, stated that they would like two additional copies as they intended adopting it as standard in their tool room.

We would like these charts placed in every shop in the Dominion and if there is not one in YOUR tool room, write for your copy at once. IT'S FREE.

CANADIAN MACHINERY,
153 University Avenue, Toronto.

Please send m us free, one of your tool grinding charts.

Signed .....

Firm Name .....

St. Address .....

City .....

Prov. .....

Stock Patterns in Hundreds of Sizes

—Special Designs for Special Requirements

Manufactured under HENDERSON Patents

All Guaranteed for Thousands of Hours at 1800° F.—

YOU do not experiment when you use Cast Nichrome heat-treating containers, racks, furnace muffles, etc. Both special designs and stock patterns are guaranteed for a definite term of service—length of guarantee, of course, depending on operating conditions.

The large variety of stock patterns is the result of the extensive use of Cast Nichrome and takes care of most practical requirements. Bulletin N-21 shows lists of stock patterns in the different designs.

A new book, "Case Carbonizing," describes modern standardized methods as practiced in many of the foremost plants, and is free to heat-treating men and men who are responsible for heat-treating results.

Be sure to give your official title when asking for this Case Carbonizing Book.

Cast Nichrome can be manufactured only under the Henderson Patents which are owned by the

Heat-Treating Containers of

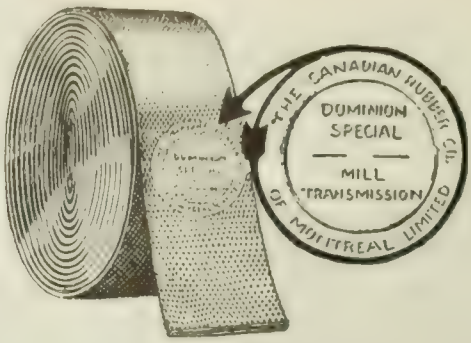
CANADIAN DRIVER-HARRIS CO.
WALKERVILLE, ONT.
American Office and Works
Chicago-Detroit Harrison, N. J. England-France

Cast Nichrome

ENDURE IN HIGH TEMPERATURE

If what you read is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Stop The Leaks That Steal Your Profits



There are many expensive leaks in your plant that you know nothing about. Loss of power through slippage on pulleys—spoiled materials—idle machines—employees paid for time while repairs are being made—wrong placing of belts—each one costs you money in lost production. They take more out of your profits than **our better belts** would cost.

Dominion Friction Surface Belting

will eliminate most transmission troubles. By keeping your plant running continuously, it will save the cost of idle machines and idle employees, reduce your cost of upkeep and power bills. It stops most transmission leaks and increases your profits in the same ratio.

Our engineers are ready to demonstrate to you, without charge, that Dominion Friction Surface Belting will lower your manufacturing costs. They will make a complete analysis of your transmission equipment and put it on the nearest approach to a 100 per cent. efficiency basis.

Phone, wire, or write our nearest service branch.

DOMINION RUBBER SYSTEM AND ASSOCIATED COMPANIES

Our Dominion Hose, Packing and Industrial Rubber Goods are all the Same High Standard as Dominion Friction Surface Belting.

DOMINION RUBBER SYSTEM

Service Branches

Halifax	**Toronto**	**Fort William**	**Edmonton**
St. John	**Hamilton**	**Winnipeg**	**Calgary**
Quebec	**London**	**Brandon**	**Lethbridge**
Montreal	**Kitchener**	**Regina**	**Vancouver**
Ottawa	**North Bay**	**Saskatoon**	**Victoria**

Belting

Transmission: "Dominion," "Keewatin," "Para."
Conveyor: "Rockproof," "Canadian," "Hiheat"
Elevator: "Dominion," "Rockproof."
Agricultural: "Dominion," "Star."
Grain Elevator: "Metcalf Standard," "Grain King."

Hose

Air: "Kushion Kover," "4810 Airtite," "Star."
Steam: "Indestructible," "Rockproof," "Para."
Water: "Indestructible," "Para," "Kushion Kover," "Star."
Suction: "Para," "Star," "Trade."
Garden: "Canadian," "Dominion," "Star."

Packing

Sheet: "Join-Tite," "Star," "Importers."
Rod: "Cabestos," "Valve-Bestos," "Canadian."
Valves: "Montreal," "Commercial," "Canadian."

Miscellaneous

Mats, Matting and Flooring, Plumbers' Specialties, Rubber-Covered Rolls, Friction Tape, Splicing Compound, Dredging Sleeves, Hard Rubber Goods, Tubing, Rinex Soles, Catspaw Heels, Jar Rings, Moulded Goods.

If interested tear out this page and place with letters to be answered.

BROWN'S
Brass
Copper, Bronze
& Gilding Metals
In Sheets, Rolls, Plates and Rods
Brown's Beaver Brand Metals have become the standard in Canada whereby the quality of other metals is judged.
Our products are fabricated from Raw Metals, mined and refined in Canada.
MADE IN CANADA
Brown's Copper & Brass
Rolling Mills, Limited
New Toronto, Ont.
COPPER & BRASS
BROWN'S
QUALITY
ROLLING MILLS

STEEL TUBING
CLOSE Joints and Welded Steel Tubing for Bedsteads, Trolley Arms, Agricultural Implements, and all other manufacturing purposes, reliable quality, uniform in size, 14 to 20 gauge, 3/8" to 2" outside diameter.
STANDARD TUBE COMPANY, LIMITED
WOODSTOCK, ONT

INDEX TO ADVERTISERS

A

Acme Machinery Co. 28
Acme Machine Tool Co. 58
Ackworthie Ltd., John 6
Aikenhead Hardware Ltd. 99
Algoma Steel Corp. 4
American Lead Pencil Co. 36
American Pipe Bending Machine Co. 125
Armstrong Bros. Tool Co..... 140
Armstrong Whitworth of Can., Ltd. 78, 79
Atlas Press Co. 105
Atkins Co., Ltd., E. C. 97
Atkins Co., Ltd., W. 52

B

Barber Machinery Co., F. F.... 106
Barnes Co., Wallace 138
Baird Machine Co. 123
Bernard Industrial Co., A. ... 44
Bertram & Sons Co., John... 1
Bertrams, Ltd. 104
Bilton Machine Tool 53
Bliss Co., E. W. 40
Bowser & Co., S. F. 58
Brantford Oven Rack Co. 104
Bristol Co. 27
British Smelting & Refining Co. 132
Brown, Boggs & Co. 11
Brown's Copper & Brass Rolling Mills, Ltd. 144
Brown Engineering Co. 126
Brown & Sharpe Co. 60
Burgess & Marchand 124
Burke Machine Tool Co. 39

C

Can. Atlas Crucible Steel Co... 137
Canada Foundries & Forgings.. 37
Canada Machinery Corporation Outside back cover
Canada Metal Co. 23
Canada Wire & Iron Goods Co.. 122
Can. Consolidated Rubber Co... 143
Can. Fairbanks-Morse Co., Ltd. 64
Can. Desmond-Stephan Mfg. Co., Ltd. 7
Can. Drawn Steel Co. 125
Can. Driver-Harris Co., Ltd. 122, 142
Can. Hart Products Ltd. 19
Can. Ingersoll-Rand Co. 6
Can. Steel Foundries, Ltd. 9
Can. Winkley Co. 124
Carter Welding Co. 106
Cataract Refining Co. 26
Cincinnati Elec. Tool Co. 124
Classified Opportunities 106-110
Cleveland Twist Drill Co. 114
Cook, A. S. 36
Crane Ltd. 122
Crescent Machine Co. 122
Curtis Pneumatic Machine Co. 125
Cushman Chuck Co. 34

D

Darling Bros., Ltd. 123
Davidson Mfg. Co., Ltd., The Thos. 126
Davis-Bournonville Co. 123
Dickow, Fred C. 104
Dom. Abrasive Wheel Co., Ltd.. 53
Dominion Belting Co. 105
Dom. Bridge Co., Ltd. 46
Dominion Engineering Co. 46
Dom. Forge & Stamping Co... 37
Dom. Foundries & Steel Co..... 9
Dominion Oxygen Co. 32
Dominion Steel Products 105
Drury Co., H. A. 133

E

Eclipse Counterbore Co. 124
Economy Drawing Table Co. .. 124
Elec. Furnace Construction Co. 120
Elk Firebrick Co. 107

F

Fellows Gear Shaper Co. 56
Fetherstonhaugh & Co..... 104
Fisher Motor Co. 123
Ford Chain Block Co. 38
Ford-Smith Machine Co. 10
Frost Mfg. Co. 124
Franklin Die Casting Corp. ... 27

G

Galt Machine Screw Co. 22
Gardner & Sons 42
Garlock-Walker Machy. Co..... 108
Geometric Tool Co. 95
General Combustion Co. 43
Gisholt Machine Co. 63
Graton & Knight Mfg. Co..... 125
Greenfield Tap & Die Corp. ... 48
Guilford & Sons, Ltd. 107

H

Hamilton Engineering Service, Ltd. 104
Hamilton Gear Machine Co... 125
Hanna & Co., M. A. 42
Heald Machine Co. 25
Hendey Machine Co. 146
Henry & Wright Mfg. Co. 12
Hepburn Ltd., J. T. 38
High Speed Hammer Co. Front cover
Hoefer Mfg. Co. 61
Holden Co. .....Inside back cover
Holly, R. S. 107
Hoyt Metal Co. 27
Hughes, Owen Co., Ltd. 122
Hull Iron & Steel Foundries, Ltd. 137

I

Independent Pneumatic Tool Co. 50
Ingersoll File Co. 141
Ingersoll Machine Co., Ltd. ... 5
International Malleable Iron Co., Ltd. 113
International Nickel Co. 18

J

Jardine & Co., A. B. 13
Johnston Machine Co., Carlyle 8
Jones & Glassco 30
Joyce-Koebel Co. 140

K

Katie Foundry 120
Kearney & Trecker Co. 24
Keller Pneumatic Tool Co..... 36
Kennedy & Sons, Ltd., Wm... 140
Ker & Goodwin Machinery Co.. 34
Kimber & Hillier Mfg. Co. 104

L

Landis Machine Co. 21
Landis Tool Co. 47
La Salle Tool Co. 13
Lehmann Machine Co. 39
Lourie Mfg. Co. 30
L. & P. Mfg. Co. 51

M

Madison Mfg. Co. 126
Magnolia Metal Co. 7
Manitoba Steel Foundries, Ltd.. 122
Mapleleaf Mfg. Co. 6
Marion & Marion 104
McDougall Co., Ltd., R. 59
McLaren Co., D. K. 55
McLaren Belting Co., J. C..... 125
Mechanical Engineering Co... 122
Miller Bros. & Sons, Ltd. 123
Modern Tool Co. 54
Morris Crane & Hoist Co., Herbert 41
Morrow Screw & Nut Co., J... 103
Morse Chain Co. 33
Morse Twist Drill Co. 30
Morton Mfg. Co. 29
Moore & Sons, Thos. 108

N

National Acme Co. 35, 139
National Machinery Co. 122
Nicholson File Co. 45
Northern Crane Works 50
Northern Electric Co. 20
Norton, A. O. 123
Norton Co. of Can., Ltd. 62
Nova Scotia Steel & Coal Co... 59

O

Oakley Chemical Co. 62
Oliver Machinery Co. 42
Ontario Metal Products Co..... 107

P

Parmenter & Bulloch Co. 123
Perrin Ltd., William 23
Petrie Co., Ltd., H. W. 57
Philadelphia Gear Works 125
Photostat Corporation 49
Pillatt & Co. 104
Pilot Steel & Tool Co. 39
Pink, Thomas 31
Positive Clutch & Pulley Works 123
Pratt & Whitney..Inside front cover
Prest-O-Lite Co. 36
Puro Sanitary Drinking Fountain Co. 104

R

Railway Roller Bearing Co. ... 8
Renold Co. of Can., Hans. 31
Rockford Drilling Machine Co.. 124
Rockford Milling Machine Co... 38
Rice Lewis & Son 136
Rockwell Co., W. S. 126
Roelofson Machine & Tool Co... 17
Royal Bank of Canada 47

S

Selson Engineering Co. 23
Sheffield Engineering Co. 123
Shepard Electric Crane & Hoist Co. 45
Shuster Co., F. B. 22
Sidney Machine Co. 31
Skinner Bros. Mfg. Co. 110
Skinner Chuck Co. 34
Smith Belting Co., N. 104
Standard Optical Co. 2
Standard Tube Co. 145
Starrett Co., L. S. 15
Steel Co. of Can., Ltd. 124
Steele Ltd., James 105
Steinle Turret Machine Co. 8
Stoll Co., D. H. 123
Strelinger Co. of Can. 109
Sumner & Co. 12

T

Tabor Mfg. Co. 12
Tallman Brass & Metal Co. ... 13
Terry & Co., John 44
Toledo Mach. & Tool Co..... 137
Trahern Pump Co. 52
Tube Co. of Canada 51
Tullis & Son Ltd., John..... 132

U

Union Drawn Steel Co. 125
Union Mfg. Co. 34
United Alloy Steel Corp. 121
Underwood Corp., H. B. 7
United States Machine Tool Co. 26
United States Elec. Tool Co... 22
Universal Machine & Tool Co... 133

V

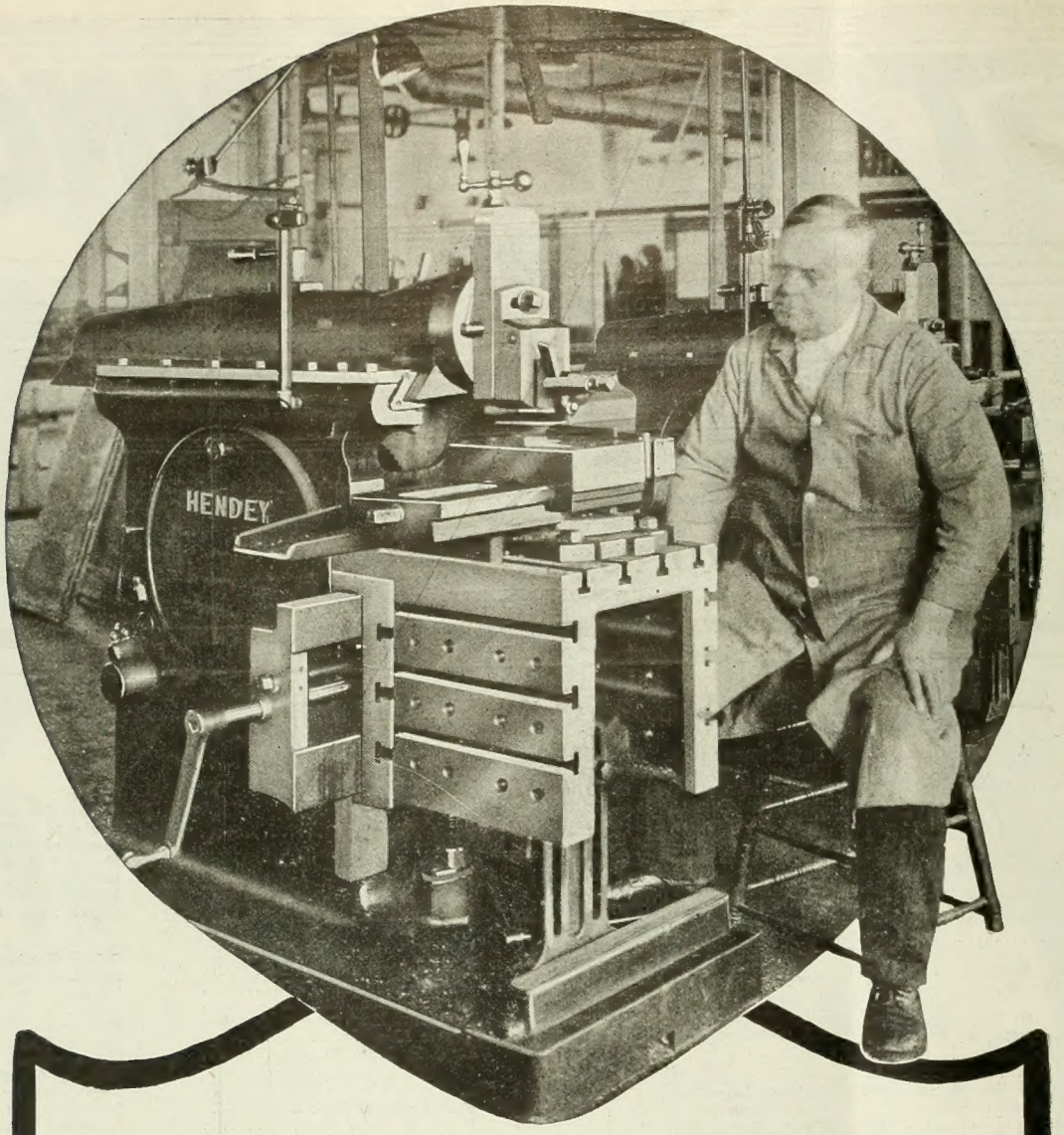
Vanadium-Alloys Steel Co. 37
Victoria Foundry Co. 123
Vulcan Crucible Steel Co. 141

W

Waltham Grinding Wheel Co... 130
Walton Co. 26
Warner & Swasey Co. 130
Wheel Trueing Tool Co. 123
Williams Machy. Co., A. R... 93
Williams Co., J. H. 135
Williams Machy. & Supply Co., Ltd. 129
Williams Tool Corp. 14
Willson Goggles, Inc. 123
Wisconsin Electric Co. 101

Y

Yeates Machinery Co. 106



Where Kodaks Are Created

Two 16-inch Hendey Crank Shapers and the 20-inch Shaper shown above help maintain the high quality for which all Kodak Products are noted.

The foreman's comment when spoken to regarding the precision and general utility of the Hendey, **"It's a real machine,"** describes aptly the Hendey Shaper.

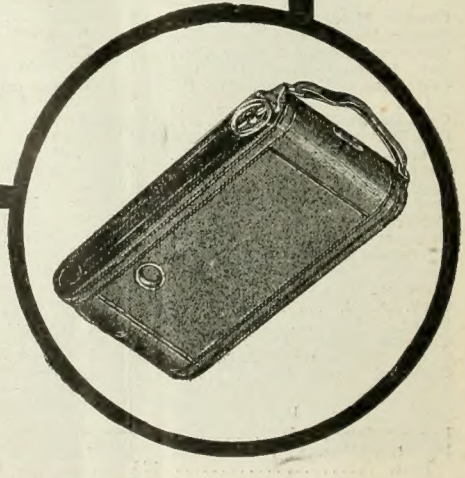
Bear in mind what the many well-known users of Hendeys say of the service they are securing when in need of Shapers, Lathes or Millers.

THE HENDEY MACHINE COMPANY

TORRINGTON, CONN., U.S.A.

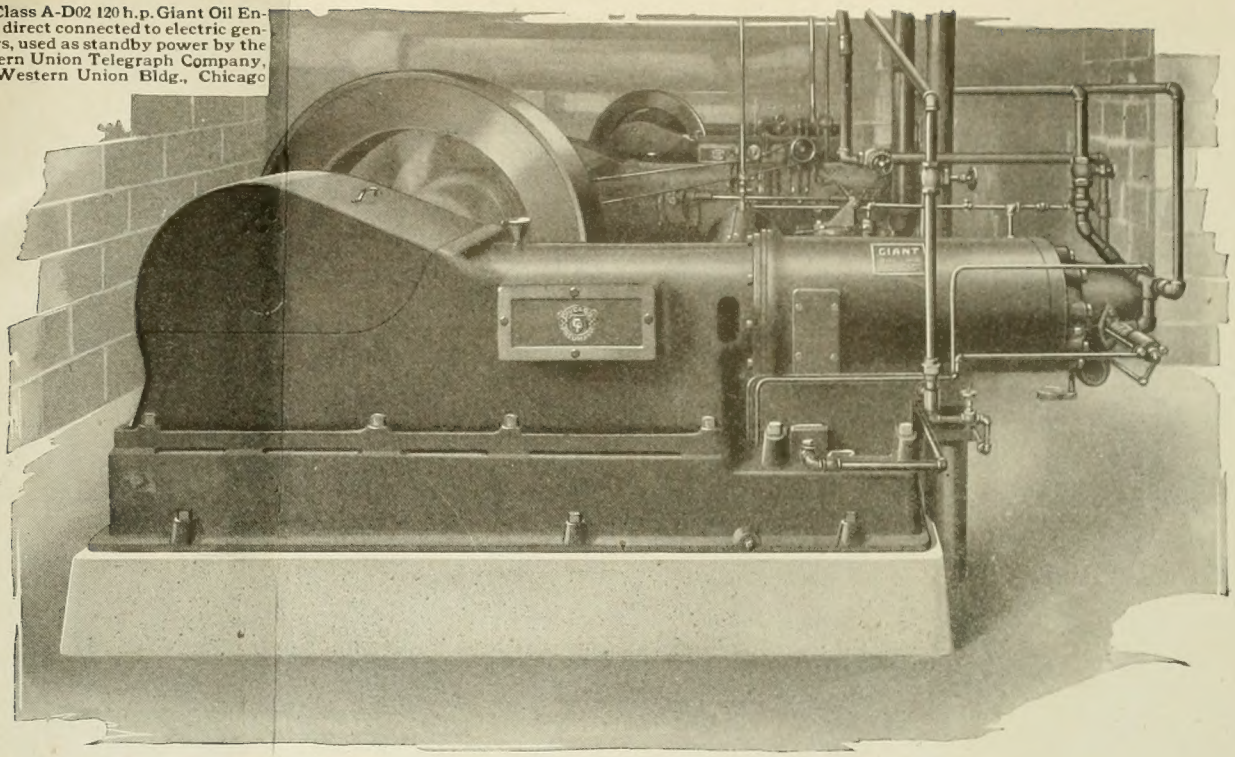
Canadian Agents:

A. R. Williams Machinery Co., Toronto, Ont.
A. R. Williams Machinery Co., Vancouver, B.C.
A. R. Williams Machinery Co., 260 Princess St., Winnipeg.
A. R. Williams Machinery Co., St. John, N.B.
Williams & Wilson, Montreal.



HENDEY SHAPER

If interested tear out this page and place with letters to be ***answered.***



Two Class A-D02 120 h.p. Giant Oil Engines, direct connected to electric generators, used as standby power by the Western Union Telegraph Company, new Western Union Bldg., Chicago

Why Giant Oil Engines have a cross-head

THE Giant cross-head and the efficient lubrication system which it makes possible, *double engine life.*

Giant cross-head construction conforms to high-grade steam engine design. It prevents side pressure against the cylinder walls. It obviates uneven cylinder wear, worn pistons, loss of compression and consequent hard-starting. It reduces friction to a minimum. It provides easy accessibility to all moving parts by permitting the use of readily removable frame covers. It permits compressing the charging pressure in the cylinder proper, and not in the crank case where leakage is almost unavoidable. It allows the crank end of the cylinder to be closed, thus providing for full *automatic splash lubricating system.*

The Giant system of lubrication is *positive-oiling, continuous in circulation, entirely automatic.* It saves time and saves oil.

Longer life and lower power costs invariably result from these and other Giant features that prove the worth of Giant Engines on a cost-per-year basis.

How much can Giant Oil Engines reduce *your* power bills? Engineering counsel, extended without obligation, is available to assist you in answering this important question. Giant Engines are built in single and duplex types, capacities 12 to 200 h. p. Ask for Bulletin 389.

Sales Representatives

The Holden Company, Limited

354-356 St. James Street, Montreal, Canada

Sales and Service Branches: TORONTO, 342 Adelaide Street, West WINNIPEG, 150 Princess Street VANCOUVER, 81 Pender Street

Canadian Factory: Canadian Pneumatic Tool Company, Montreal

EN 41 - H

BOYER PNEUMATIC HAMMERS · · LITTLE GIANT PNEUMATIC AND ELECTRIC TOOLS
CHICAGO PNEUMATIC AIR COMPRESSORS · · VACUUM PUMPS · · PNEUMATIC HOISTS
GIANT OIL AND GAS ENGINES ROCK DRILLS · · COAL DRILLS

GIANT ENGINES

Dependable Power at *Less Cost Per Hour*

C.M.C.

26" x 30" Crank Shaper

is distinctive. Its mechanism is simple but effective. Within easy reach of the operator's right hand is the down feed to head, automatic cross feed, handle for changing the length of stroke, the speed changes, and always in sight is the constant-reading stroke indicator showing at all times the stroke the machine is set for, whether in operation or not.

Write us for special bulletin and prices.

CANADA MACHINERY CORPORATION
LIMITED
GALT, ONTARIO

Accuracy
Production